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ABSTRACT

Offered in this teacher's guide are activity suggestions, research ideas, discussion questions, and problems to solve dealing with aviation education. Topical areas consider sound and the environment, changes and adjustments in sounds, planning and control of noise, communications, economics, and mathematical and scientific aspects of sound and noise. Several short stories and a poem appropriate for the elementary grades are presented together with follow-up activities for each selection. Completing the guide are resources for classroom and student use including books, motion pictures, filmstrips, publications, sources for airplane photographs, and a glossary of terms. (BL)

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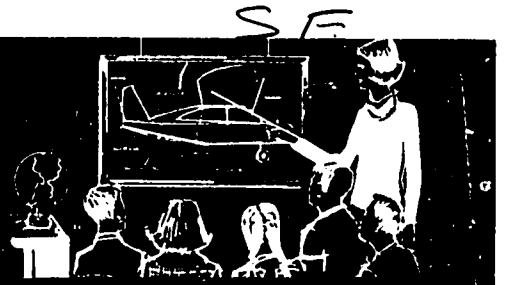

AVIATION EDUCATION

OFFICE OF GENERAL AVIATION AFFAIRS / FEDERAL AVIATION ADMINISTRATION / DEPARTMENT OF TRANSPORTATION
WASHINGTON, D.C. 20590

ENVIRONMENT

COMMUNICATION

ECONOMICS

TEACHER'S GUIDE

FOR

SST..T..T (SOUND, SENSE, TODAY, TOMORROW, THEREAFTER)

RESEARCH

SOUNDS AROUND YOU,

ABOVE AND BEYOND YOU.

SCIENCE AND MATH

PROBLEM SOLVING

Printed by:
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TABLE OF CONCEPTS

TEACHER'S GUIDE for
SST..T..T (Sound, Sense, Today, Tomorrow, Thereafter)

I. Environment

A. Sounds Around You

1. Have the children close their eyes, put their heads on the desk and listen for the sounds around them. What do the children hear? Have the children identify:

   a. specific sounds.
   b. loud sounds and soft sounds.
   c. sounds that are varied in tone and pitch.

2. Have several children play rhythm band instruments while the rest of the class have their eyes closed. Have the children guess which instruments were being played. Then they may look and check their responses.

3. Take a sound tour around the school building, community. Discuss what you hear. What was pleasant, unpleasant or in between?

4. Record sounds of school room, cafeteria, library, gymnasium, etc. Discuss the difference.

5. Play a record or create sounds. Have children artistically express their response in any of these ways: Oral or written form, drama, dance, drawings.

6. Use the filmstrip and record, "Sounds Around You" or other material of this type which might be available.

7. Have the children make a list of the sounds they hear on their way home and at home. Then separate the list into categories such as noisy, quiet.

8. Can the children identify a type of plane by the sounds it makes?

9. Compare the sounds in other cultures with sounds in our culture by showing films, and filmstrips.

10. Use poetry that depicts sounds in nature or other parts of the environment, particularly poems about aviation.

B. Changes and Adjustment

1. From a list of sounds have the children place these sounds on a time line.

   a. What sounds do we no longer hear?
   b. What sounds do we hear today that people did not hear 5 years ago, 100 years ago, ages ago?

2.

B. Changes and Adjustment (Continued)

c. What sounds do the children think people will hear 5 years from now, 10 years from now, many years from now?

2. Divide a piece of paper into three parts. Have the children draw a baby in the first section, a teenager in the second section and an adult in the third section. Have the children show the facial expression of each person in response to a given sound, thunder, siren or sonic boom.

3. a. Suggest that the children bring their model airplanes to school. Have them set up a museum, labeling the planes as to the date of origin. Discuss adjustments that have been made in design.

b. Have children design the SST and planes of the future. With an older group they should develop specifications and be able to justify their design or model.

4. Have a picture collection of modes of transportatior through the years, i.e., 1860, 1900, 1925, 1975, 2000. Compare the sights and sounds of these pictures, differences and similarities. How have people had to adjust to the technological changes that have occurred?

5. Paint or construct an airport that existed years ago; present day airport; and an airport of the future. Discuss the sounds heard at these various airports.

6. Take the class to an airport and/or museum.

a. If a trip to a museum is possible, look for and discuss the evolution of the airplane.

7. a. Do role playing to show change in attitude for and against noise in the environment. For example, set up a complaint department at an airport and have various pupils assume different viewpoints.

b. Use news media - such as newspaper, TV - to find how they influence people in the toleration of noise.

8. Discuss why some noises are necessary. Have the children make a list, collect pictures of any apparatus that make noise for a beneficial purpose. Discuss the attitudes of people toward these noises.

C. Planning and Control

1. Make a collection of insulating materials. Have the child perform a simple test showing the effectiveness of the insulators. Example: drop a marble in a metal can. Record the sound on tape. Line the can with an insulator (cotton, fiberglass). Record on tape the sound. Discuss the following points:

   a. Are the sounds different?
   b. Which seems to be the best insulator?
   c. Why is it better?
   d. Can you find something in the make-up of the insulator that would account for the difference?

2. Have the children rate the insulators by graphing. For example, make a list of types of insulators used. Rate the loudness or softness of the sound. Identify the loudest as 1, next loudest 2, etc. Graph the results.

3. Discuss what has been done in homes, schools, churches, and various modes of transportation to muffle noise.

4. Open the windows of the classroom. Listen and discuss the noise. Close the windows. What is the difference in the noise heard?

5. Invite resource people available in your area to visit and discuss planning for noise control.

6. Set up an urban planning commission in your classroom. How would you plan for housing, airport, business areas, maintenance, etc., in order to have better noise control.

7. Contact your airports to find out what is being done to control noise.

II. Communication

A. Sound is .... Noise is ....

1. a. Have the class give their ideas of what sound is. Then contrast this with: Noise is .... (These may be recorded on board, chart, ditto, etc.) What makes the difference?

   b. Let them select one item from each list to illustrate.

2. a. Listen to various tape recordings of sounds. Separate these into categories of sounds of a city, sounds of country, etc.

   b. Decide which they consider noise, which they consider sound, and list these. What makes the difference?

3. Have the children write and produce a TV program on Sound vs. Noise or the SST Program. This could be taped for use on closed circuit television if equipment is available.

4. Give children a list of noises. Have them rate the noises giving a numerical value from one to ten. One could be the one they like best. Then give the children another list with descriptive words before the noises. Examples might be: Shrill of a whistle, blare of a siren, thunderous drill, whine of a jet, shriek of a blue jay, hiss of a snake.

   Compare the ratings of the two lists to determine if any difference or change in attitude toward sounds is observable.

5. Debate the following topics:

   a. Airplanes are noisy.
   b. The SST should be abolished
   c. Supersonic aircraft are not safe.
   d. Man must learn to live with the sonic boom.
   e. The SST should fly only over the ocean.

6. Creative writing and storytelling.

   Suggested topics are:

   a. Noises About Me
   b. Sounds I Love
   c. The Day I Rode on the SST
   d. If I were a Sonic Boom
   e. The Loudest Noise I Ever Heard
   f. The Magic of Noise
   g. I was an X-15 Test Pilot
   h. A Look into the Future
   i. The Year 2000
   j. The Super Sonic Corridor
   k. A Hypersonic Engineer
   l. Building a City of the Future
   m. My Life as a (member of the crew) of the SST

7. Jingles and Poetry

   a. Give children a word or acronym: sound, sonic boom, SST, etc. Discuss words that are related to these. Then refine the list to have the seventeen syllables necessary for a

Haiku poem. It would be a good idea to read other poetry of this type before beginning this activity.

b. Children could write or listen to riddles in poetry form. They try to guess the answer.

(Examples)

I am a thud
Loud and clear
They say it's pressure
What do you hear?
I'm long and sleek
I'm speedy too
I'll be in Paris
Ahead of you

c. Collect poems about sounds (SST) and aviation. Use in choral reading or reading appreciation.

8. Role Playing

a. Take the various roles of a newspaper staff such as editor, news reporter, society reporter, sports reporter, want ad writer, citizen letters to the editor or cartoonist. Have children write copy for these various positions.

b. They could publish this in a newspaper form.

9. Games

a. Play Airport

Have children take different roles of people concerned with an airport. (Ex.: pilots, stewardesses, traffic controllers, safety officer, etc.) They could show a normal day at the airport, times of excitement and activity.

b. Twenty questions

Children could be thinking of the SST, the sonic boom, noise, or anything concerned with airplanes and airports. The rest of the class can ask questions about the unknown word that can be answered with a "yes" or "no" - up to 20. Try to guess the word.

c. Spelling Bee of terms related to aviation, noise, sounds, etc.

Use the words in meaningful sentences.

d. Charades

Have children act out various aviation words and phrases.

Examples: sonic boom, control tower, sub-sonic - supersonic, mock-up and experimental flight, etc. Try to guess the word.

10. a. Collect articles on noise, aviation, or SST from newspaper or magazine. Compare the news articles on the same subject. Determine if there are any subjective, inferential statements that might be directed toward influencing the public to adopt a certain attitude.

b. Arrange a bulletin board showing current interests in aviation.

11. a. Arrange these words in order going from the most general to the most specific:

aircraft SST moving vehicle jet

answers: moving vehicle aircraft jet SST

b. Arrange from slowest to fastest:

airplane, auto, missile, train, bicycle, motorbike, horse, SST

answers: horse, bicycle, motorbike, auto, train, airplane, SST, missile

c. Arrange these sounds from the lowest sound under normal conditions:

whispering, shouting, talking, mouthing, shrieking

answers: mouthing whispering talking shouting shrieking

12. Fact vs. Inference

a. Ask the children to tell what they think are true statements related to aircraft, noise, sonic boom, or SST. List these on the board. Have the children discuss each statement to try to determine which are facts and which are inferences. For facts they should ask themselves if it can or has been proved or if they can tell by using one of the five senses.

III. Research

A. Why?.... How? .... What? ....

1. Titanium - its source; uses; availability of; cost; manufacture of, production.

2. Aluminum research to compare with titanium - use, source cost, strength, etc.

3. Make a survey of noise complaints to analyze nuisance complaints compared to legitimate ones.

4. Have children find out as much information as possible about Russian TU-144, considering aspects of passenger capacity, weight, size, life span, cost, etc., as compared to The Concorde and the SST.

5. What is Public Law 90-411 of July 21, 1968? What is its purpose? How will it affect aircraft noises and sonic boom?

6. Trace the history of the SST program.

7. What is being done for communities surrounding the airports to alleviate some of the noise problem for these citizens?

8. Write a research paper on how we hear and how sounds of varying pitches and frequencies will change the workings of the inner ear. Drawings can accompany research on the ear.

9. Research methods of communication with animals; how they hear, how various sounds affect them and predict how a sonic boom of different intensities may affect their hearing. Classroom experiments can be conducted to prove any of their conclusions.

10. Conduct research on various careers in aviation. Include data on amount of training required, salary, responsibility involved, etc.

11. Investigate types of noises various cultures are accustomed to. For example: Within the African jungle, the Arctic Zone, the Pacific Islands.

12. Research on the initial discovery of the sonic boom. Include who was responsible for the theory. How far has this research been developed to date?

13. How do weather conditions -- rain or snow, etc. -- affect sound? Do sounds vary in the different seasons? Why?

14. How do city noises affect city people as opposed to the effect upon suburban dwellers? Why do young people react differently than their parents to the sound level of music?

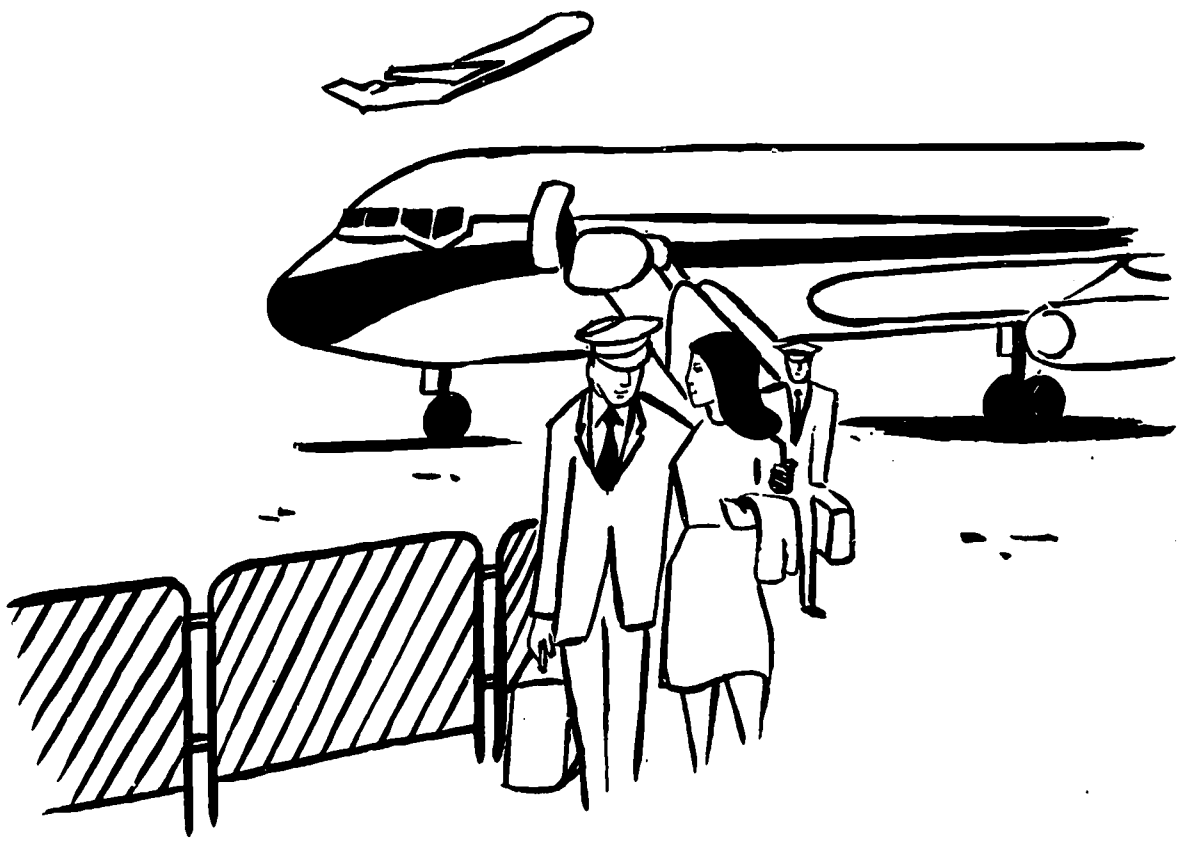
15. Design an apparatus that could be used to suppress noise on various aircraft. Find out what the jets are equipped with today to help suppress engine noise.

16. What are the 10 most active airports in the United States? List according to traffic from the busiest on down. Show the type of runway configuration used at each airport. What are the abbreviated symbols designated for each airline?

17. How was the name "Mach" derived? What does it mean? What is meant by "Threshold Mach number?" What does this threshold Mach number depend upon? In what seasons would lowest and highest threshold Mach number occur?

18. What measures do pilots take to assure maximum safety for their passengers? What else could be done in this regard?

19. What is meant by STOL? What is meant by VSTOL? What are the advantages of VSTOL?



IV. Problem-Solving

A. Dealing with the Issues

1. Establish an aviation club with elected officers and planned program. Invite resource people to discuss issues. Have panel discussions, plane design contest, etc.

2. If you were to live in the year 2068, what type of world might you find? What sounds would be outstanding? Describe the airports. How would people deal with the issues of noise and air travel?

3. You are buying a house. What factors on sound should you consider? What questions should you ask the realtor? Suppose the house was in the vicinity of an airport? Would your questions be different?

4. Mrs. Jones calls the airport every day complaining about the noise of planes over her house. How would you deal with her complaints? What could you say that would change her attitude toward this noise?

5. Pretend you have been asleep for the past 100 years and suddenly wake up to find yourself in a current American city. How would you compare the differences in sounds then and now? How would you react to the sounds you find after your long sleep?

6. Nancy plans to travel from Washington, D.C., to Atlanta, Georgia. She has a choice of traveling by plane, train, or driving her own car. What factors would influence her decision? Consider safety, cost, time, comfort, and convenience. What arguments can you give for or against each mode of travel? What decision would you make if you were she?

7. Your father is a test pilot at Hamilton Air Foce Base, Calif., and living quarters are provided for you and your family on the Base. The airport facilities have been extended to the point that the housing area has been affected by the noise. Your new baby sister cannot sleep, your parents are unable to entertain friends on the patio, and you cannot enjoy your favorite television program. There are three possible solutions to this problem:

   1. Remove the noise at its source.
   2. Close in or mask the noise.
   3. Provide ear protection.

   Discuss each possible solution and choose the one that is most practical for this family.

8. You have been asked by the city fathers to propose a plan for a new model city. Convenience and noise abatement are two considerations. (The students should consider industrial centers, business districts, housing, residential areas, airport locations and other transit systems, shopping and parking facilities, schools, churches and cultural centers. If any of the above is omitted, then the teacher should use a question approach to promote discovery.)

9. You are the manager of Dulles International Airport. Your present facilities will accommodate 4,000,000 people per year. Future expansion could triple this number. Assuming that one supersonic transport carries 250 people, how many SST's could be handled now per day? How many supersonic flights could be handled with expanded facilities (per year, per day)? What other problems would arise from handling this number of people?

10. You live in a city whose growth has circled and enclosed the local airport. Because of the increased public demand for air transportation, a second airport was built thirty minutes from the city. It was thought that this would alleviate congestion of inter-city airport. However, many citizens reject the thirty minutes drive to the suburban airport. The problem of congestion at the local airport remains. What would you do to solve this problem?

11. You are a nurse at the Willowdale Elementary School. Plan a program to teach children about their ears and how to care for them. Consider the age of the children in your audience as a factor in planning your program. (Students might want to prepare a short skit, give a brief lesson to the class, have a puppet show or T.V. program, etc.)

12. You are a reporter for the "Daily News." The sound level in the press room has been recorded at 110 dB. (high), but you are not conscious of a noise problem. The elevated train not far from your apartment window also produces a measured sound level of 110 dB. This annoys you. Why?

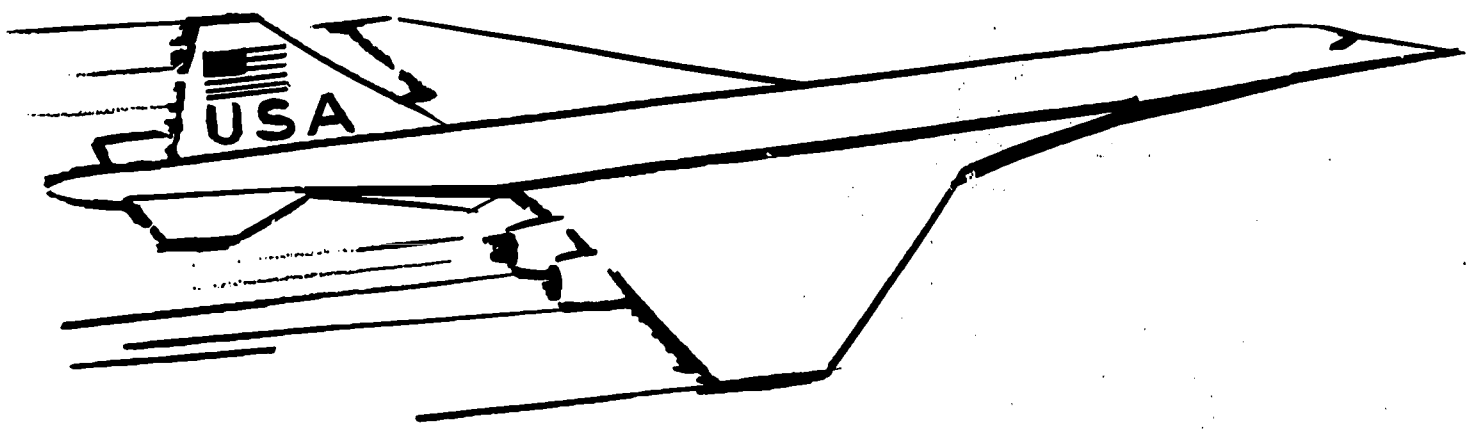
13. You are the Administrator of the Federal Aviation Administration. You have been asked to appear before a television audience to explain the phenomenon of sonic boom as a side effect of supersonic travel. You have been informed that many citizens have been concerned and upset with news that a sonic boom might cause considerable damage and thunderous noise. You must convince them that the program is important and should continue by presenting the facts about sonic booms and their effects.

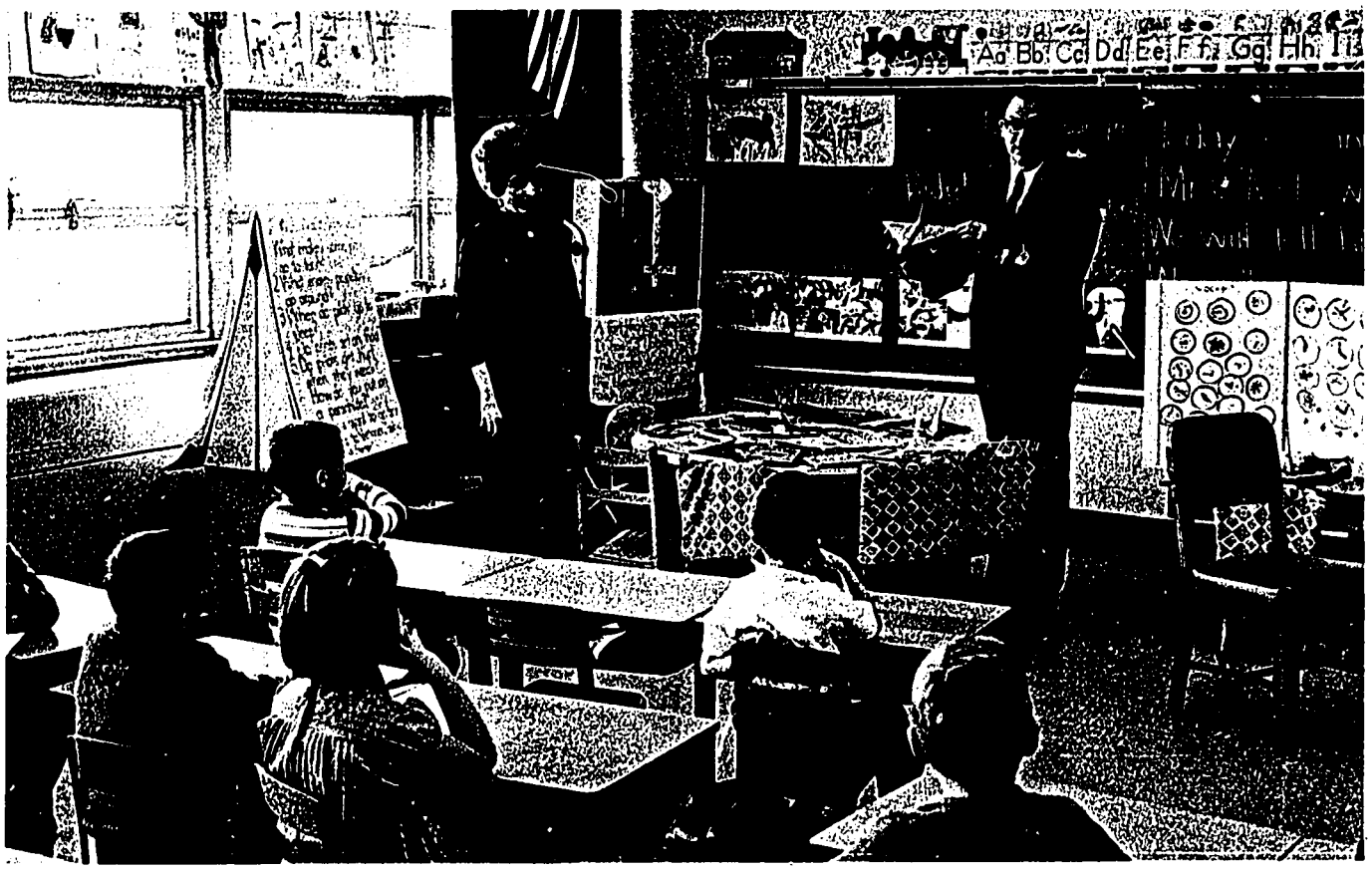
14. When you sing in the shower the neighbors bang on the walls and complain to your resident manager. When you sing in the kitchen, there is never a complaint. Why?

15. In your neighborhood there are two jazz combos, the "Supersonics" and the "Ultrasonics" Both groups produce an equal amount of noise during their practice sessions. The "Ultrasonics" are having quite a neighbor problem. In fact, the complaints about the clamor have become so numerous, the group may have to move their studio or disband completely. However, the "Supersonics", who practice just as frequently, have not heard one word of complaint from their neighbors. Why?

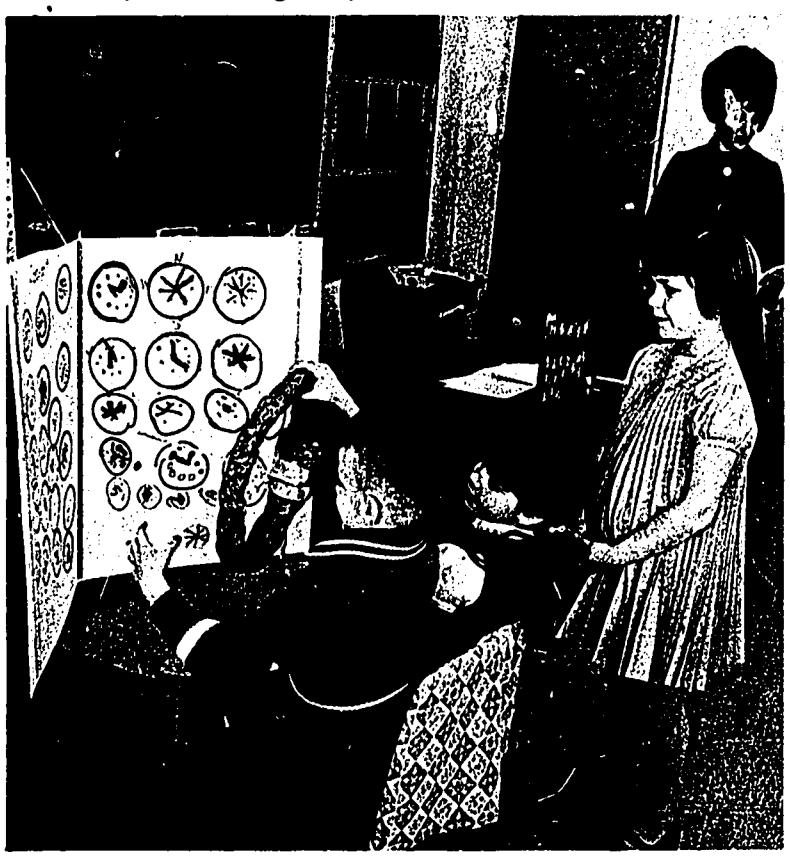
16. The music teacher often uses the classroom next to you for instrumental music instruction. At the beginning of the year you found this most disturbing but during the Spring months this did not seem to bother you. Why? What could have been done to completely eliminate this annoying problem?

17. The SST program and the sonic boom have produced different public reactions in the United States as compared to France. The French reaction has not been as severe or verbal as it has been in the United States. Are they more tolerant? Are they not as well informed? What are the differences between these two societies that causes one to be more concerned than the other?





Elementary school students listen attentively to the explanation of how mathematics and science are related to the study of aviation. The speaker is a special assistant for aviation education on the Aviation Education Staff of the Federal Aviation Administration, Washington, D. C.



A young pilot and crewmen fly their make-believe aircraft.

V. Math-Science

A. Using numbers and theories

1. Demonstrate the sonic boom in these ways:

   a. crack of a whip
   b. pop a balloon
   c. burst a paper bag

2. Discuss the fact that thunder or the crack of a pistol creates a sonic boom.

3. Demonstrate the movement of sound waves by dropping pebbles into a pond and watching the ripples around the pebble. Point out that sound waves move in all directions. By placing a stick in the ripples an interruption in the waves can be shown.

4. To show that sound waves vary, develop a pattern, and change frequency, allow two children to hold either ends of a rope. Move the rope to make various size ripples and increase their speed to show different frequencies. This will demonstrate that sound makes waves through the air. With an older group, the children can research the study of the wave frequency.

5. The Doppler Theory - Have a child stand at a given point and listen to the sound of a drum or a whistle from behind him, passing him, then before him. He will hear and should recognize the differences in pitch from various distances.

6. To illustrate the fact that various vibrations occur, depending upon the level of noise at the source, stretch a wire in front of a loud speaker. Place a piece of paper in the center of the wire. The paper can also be placed over a stretched rubber band. When various sounds of different noise levels are heard over the speaker, the students will notice changes in movement of the paper. Students can measure the vibrations with a ruler by showing how far the paper vibrates on it. They may give it a pretend decibel reading by setting up an individual standard of measurement. For example, an eighth of an inch might equal a 10 decibel reading, etc.

7. Place a bobby pin or a hairpin opened on the edge of a desk or table and snap it back. It can be placed on different objects to show how vibrations will produce different sounds.

8. Set up a weather station to measure barometric pressure, temperature, direction of the wind with a wind sock and chart their findings daily for a specified period of time. Class can make predictions about the weather and discuss why their predictions have been true or false.

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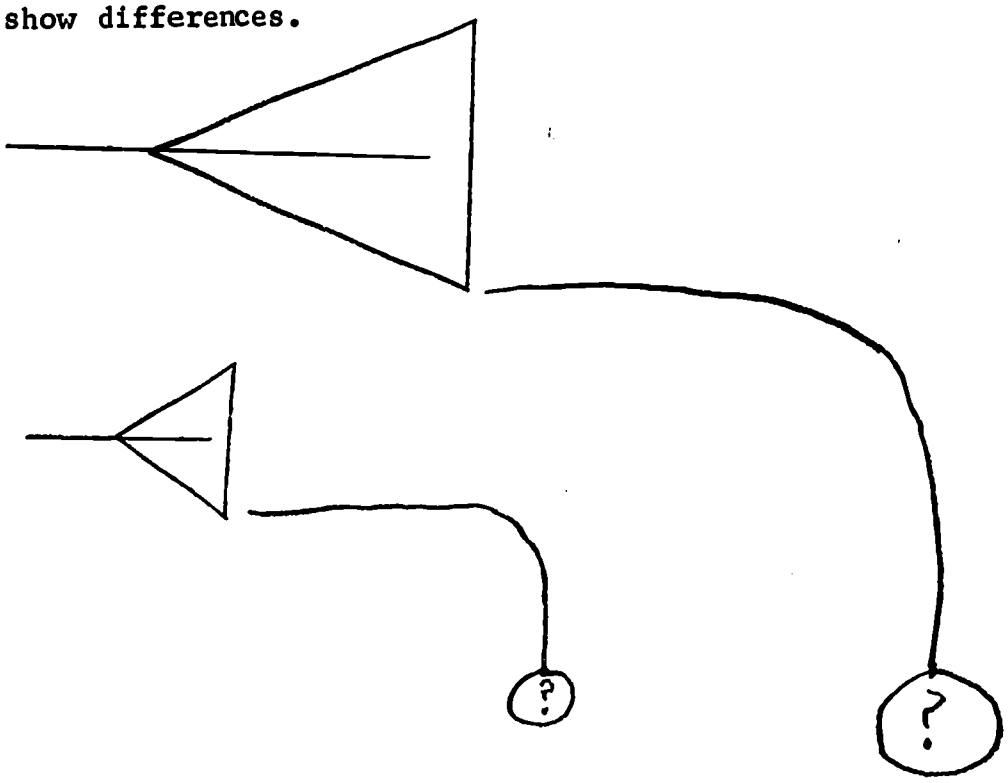
9. Conditions affecting boom signature (intensity) are:

altitude
attitude (angle)
shape of plane
weight
speed
atmosphere
wind conditions
ground conditions

These concepts could be demonstrated on transparencies to show differences.



10. Children can draw their own models of the ear and illustrate changes within inner ear that might occur because of repeated noises. Students can discuss precautions that can be taken by those within constant range of loud noises.

11. Make model aircraft of various weights to note differences in ability to climb. Students can chart or graph the results of the climb with planes of varying weights.

12. Contrast and record changes in time during an oceanic flight or trans-continental flight. Set up schedule of SST to Bremerhaven giving ground speed; check zones involved and decide what time they would arrive Bremerhaven time.

13. Let children make up their own mathematical thought problems computing with the 4 operations (addition, subtraction, multiplication, division). They may use the SST dimensions or problems from Aerospace Arithmetic as a guide.

14. Fill a glass column with water. Strike a tuning fork and listen for sound from tube. Will changing the amounts of water cause differences in sound?

VI. Economics

A. Trade-off for Progress

1. How would you write the advertisement for the first flight on the SST? How would you illustrate your advertisement to appeal to the interests of people?

2. Collect advertisements relating to present airplane travel. Look for words that are used to influence people favorably concerning the flight. Example: Whisperjet, a quiet flight in our noisy world, adventures in sight and sound, patterns in sound, jetarama, etc.

3. Topics for Discussion

a. Why do you think air travel has proved to be superior to other modes of travel?

b. Do you think our present air travel conditions are adequate? If not, what do you think needs improving? How can you get them improved?

c. Who do you think is responsible for improvements? Find out definitely by writing letters. Find out specifically what each is responsible for improving and what their program for improvements is.

d. If supersonic travel will be part of your life in the next ten years do you think you will have to change your attitude about noise tolerance, speed, etc. What could you do now to prepare others for this type of change?

e. How would the SST be different from the jets we know? What are the materials used? How is the construction different?

f. How does the SST program affect other industries in our country?

g. In what ways will a cooperative effort between countries be possible or necessary?

h. How will the SST help improve our balance of payments with other countries?

i. What factors are involved in making the SST economically profitable?

j. The U.S. Leads the world in the production and marketing of airplanes. What would happen to our economy if we should lose this lead?

4. List the advantages and disadvantages of supersonic travel. Determine which the children would prefer and why.

5. Make a mobile with the SST on one side and two disks on the other side -- one representing the government and the airlines; the other private industry. Show the percentage of money each has expended on the SST. (At this time the percentages are: government and airlines 90% of which the airlines part is very small, and Boeing and General Electric 10%). Find out why the government is willing to spend this money on this program? How will the government be re-imbursed?

6. Let children construct a community near an airport. Boxes could be used as houses. Model planes could be operated by children flying them over the houses from runways of brown paper.

   a. List the people employed by the airport and their particular jobs. Help children see how a division of labor is necessary; what jobs are available.

   b. Discuss what could be done to sound proof the houses near the airport to eliminate noise.

7. Have two children take the role of a real estate agent and a buyer of a house. Make a list of questions the buyer should ask and a list of the points the agent should stress. For example: Is this house in the fringe area, the holding area, the profile or path of incoming or departing planes? Is it sound-proof? Will the airport expand in my direction?

8. Make a bulletin board showing job opportunities in aviation.
   a. Set up an interview between a student and a representative of an airline. Explore job opportunities and future possibilities.

9. Make charts to show various modes of transportation. Show the cost of shipping a product, a package, or a person by each means. Contrast the amount of time involved. This may require research.

   a. Construct a bulletin board called: <u>A Week of Travel</u>
   Show: bus, train, jet, SST.
   Secure timetables, information, etc., from each source to establish:

Cost of the vehicle	Maximum speed
Maximum number of passengers	Maximum time
Point of departure	Cost of travel
Destination	

Conclusions should be drawn which would help point out the economic value of rapid travel to passengers, business, individuals, and government. When is it best to use each source?

10. List all materials you think would be useful in constructing an airplane, SST, etc. Find out the source, the properties of the metal, production and labor factors involved, the merchandizing and sale of the materials.

11. List and compare the cost of fares by plane for this year, last year, five years ago, earlier. This could be done for other modes of transportation. Try to determine the reasons for these changes.

# # # #

VII. Some Short Tales (SST) and a Poem

These SST stories grew from experiences during a trip from Dulles International Airport, Washington, D. C., to Los Angeles International Airport, Los Angeles, California, and to Edwards Air Force Base, Mojave Desert in California. Copies are available in limited quantities for use by your students for supplemental reading and for use in Learning Centers. (See "F" under Section VIII of this publication for list of FAA regional and area offices' addresses.)

Great interest is shown by elementary school children while viewing a display announcing Super Sonic Treasures.

LEFT BEHIND

There once was a mouse we'll call Maxwell
In whose pad he could no longer dwell
The wreckers had come
He'd find not a crumb
It's move or be moved he could tell.

Now Maxwell decided to scamper
His neighbors he learned were much faster
They'd gone on their way
The very first day
Poor Max was faced with disaster.

"Already they've moved out my kin
This runway it seems not to end
Once neighbors I had
And now its my pad
Can a plane be a mouse's best friend?"

"These tears will not help," Maxwell said,
"I must find a spot for my head
The sooner I flee
The quicker I'll see
A suitable place for my bed."

So he packed up his gear and took flight
For a house he must find before night
And not far from the wreck
Came an end to his trek --
A house on a hill was in sight!

"Is this real?" piped Max in a squeak
A house left behind, That's Unique!
If they'll leave only one
Then no farther I'll run
A future I'll have that's not bleak.

In the rafters Max found he'd a roommate
T'was a mouse with a tale to relate
Seems the squeals of these jets
Startled people and pets
So their houses were sold to the state.

Now one house was left near the source
The reason was testing, of course
A way must be found
To muffle that sound
That strikes with such shattering force.

Already the experts have started
To panel these walls where the've parted
You can not deny it
This house is so quiet
The whine of the jets has been thwarted.

Such peace not in dreams could he find
A lease did he rapidly sign
In ages to come
You'll hear just a hum
Because of the house left behind.

SUGGESTED FOLLOW-UP ACTIVITIES
LEFT BEHIND

1. What might have happened if Maxwell had not found a house left behind?

2. Draw a picture of your favorite part of the story.

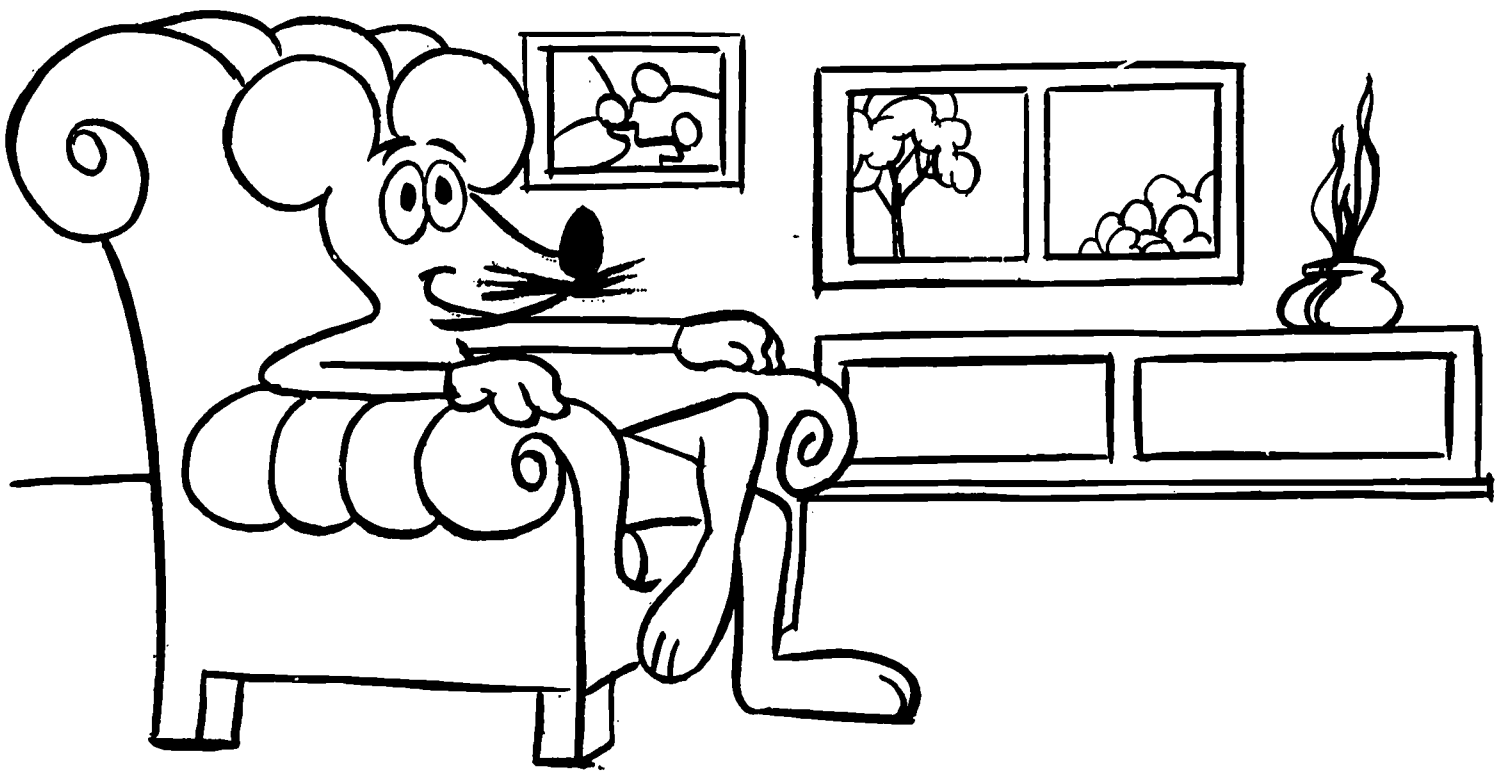
3. What is the saddest or happiest part of Maxwell's story? (Draw your interpretation of these parts)

4. Draw Maxwell's old pad and his new pad.

5. What kind of workers were making the house sound proof? Draw a picture of them working.

6. If the sound proofing is successful, how do you think the community will look 5 or 10 years from now?

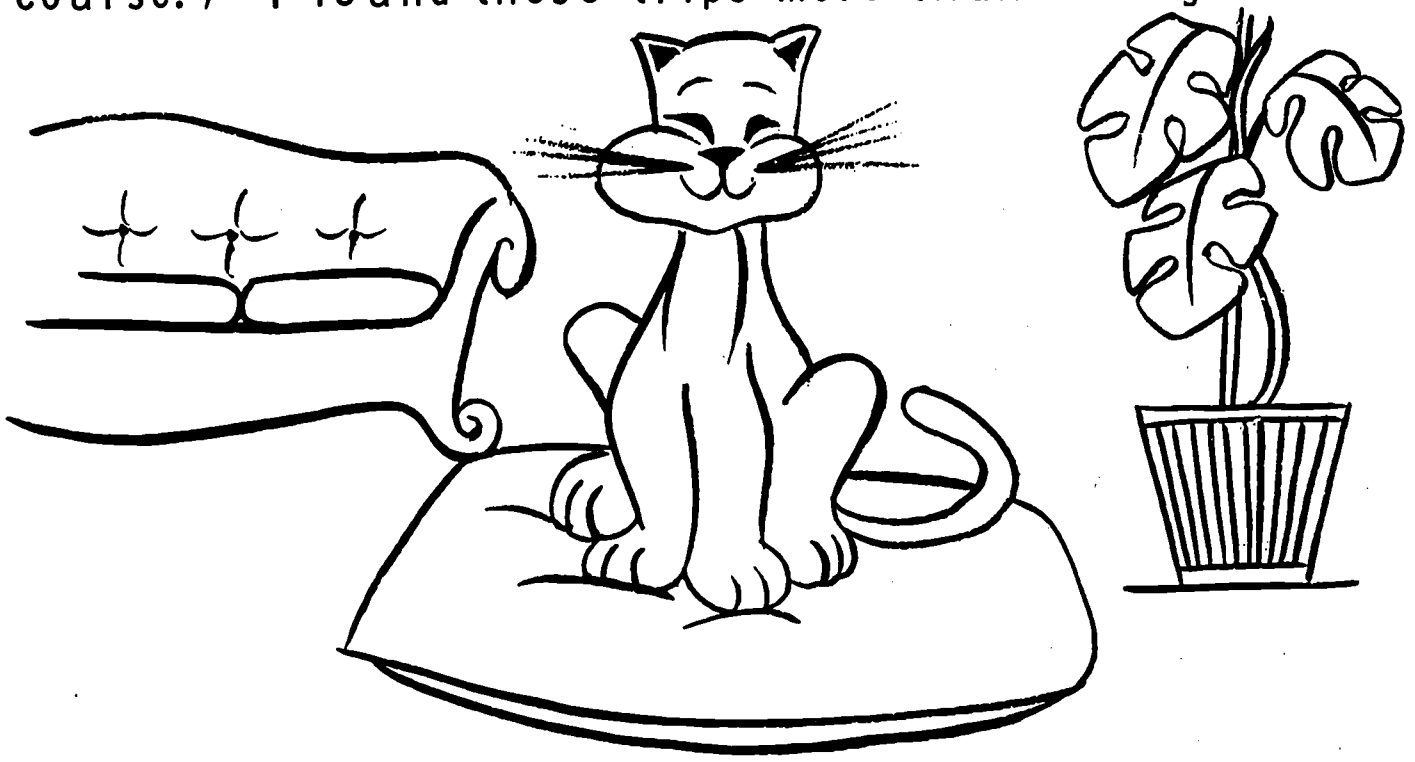
7. What places might be sound proofed first if the experimental house proves to be sound proof?



SUPERSONIC PUSSYCAT

I was just an ordinary cat -- well maybe not too ordinary!. You see my mistress does have a beautiful house in New York and I have my own red velvet pillow. And I do go to Fifi's Feline Salon once every two weeks for a perfumed bath and a manicure, but as I said life was just ordinary, in a nice sort of way, of course.

To think my life all changed because of a ride -- just an old airplane ride. Mistress often took me with her on her yearly trips to the Riviera (French, of course.) I found these trips more than boring. I had



to just sit there in my seat for eight long hours eating a bit and sleeping most of the dreary hours away.

But this year things were going to be different. Mistress kept telling me over and over again "Marita, dear Marita, this year we're going to La Belle, France on an SST." Frankly, I didn't know what she was talking about. So, I just purred and purred and hoped that the SST would serve me a better grade of liver than the last time we flew over.

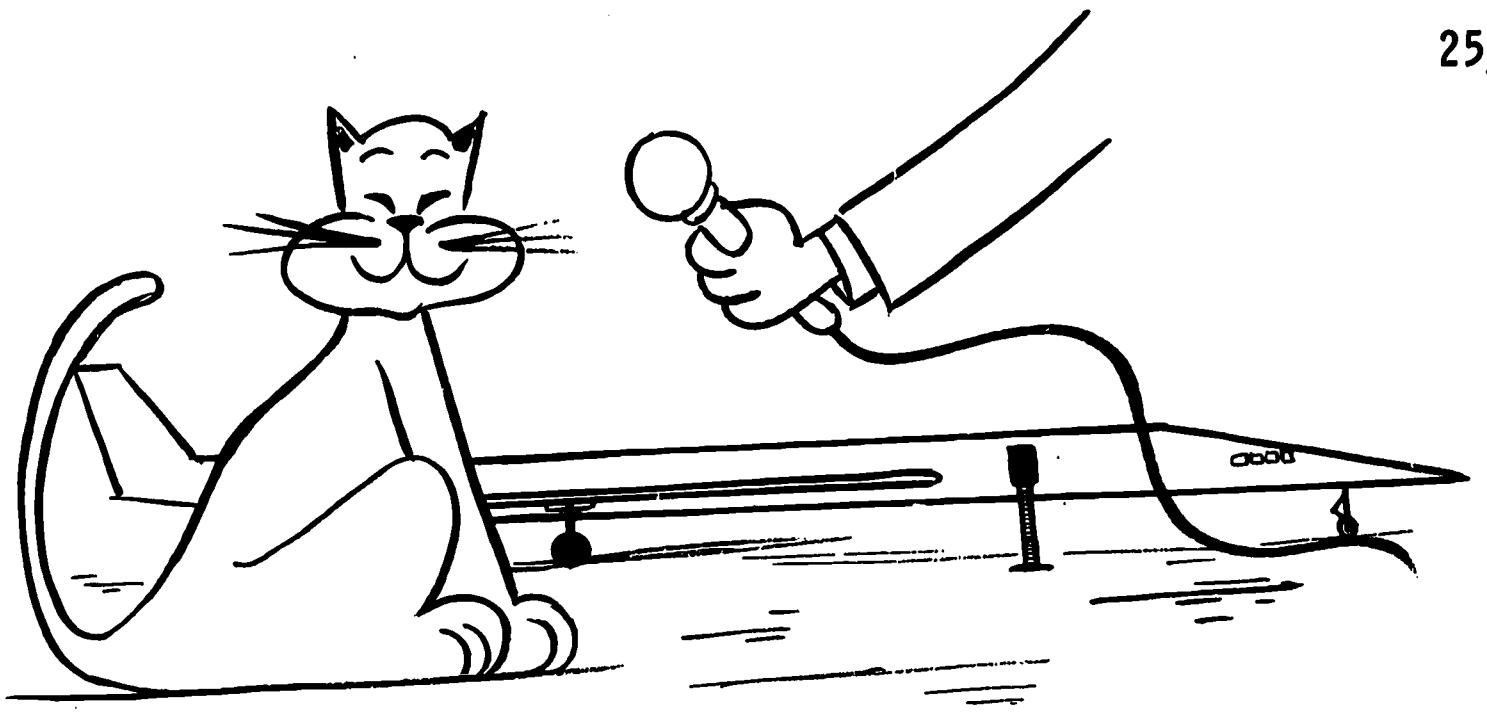
The day before we were leaving, I was sent to Fifi's. My silver fur was washed, brushed and perfumed. My nails were done particularly well. All in all, they made me even more lovely than usual.

Bright and early the next morning, Mistress and I were off to the airport. Planes here, planes there! My mistress took me aboard the biggest plane I had ever seen. It looked like a flying hotel with a pointed nose. It has a ceiling just like home and I never saw so many people. Why, there must have been well over 200 people aboard!

We made ourselves comfortable in the large roomy seats and before we knew it we were airborne. The ride seemed normal enough at first, but suddenly the pilot announced to all of us that we were cruising at an altitude of 64,000 feet and at a speed of 1800 mph -- faster than the speed of sound. Why at this rate, I thought, we'd be in Paris in less than three hours. By the time I had a few slivers of liver (excellent, by the way) and watched a short movie, we had arrived.

Well to make things even more interesting, when we deplaned there were many reporters and photographers to meet us. You see, we were the first Supersonic Transport (that's the same as SST) to cross the Atlantic. Naturally, I was the only cat on board, so the newsmen made a great big fuss over me. I had to pose this way and that. They asked Mistress all kinds of questions - - - about me, of course. It all got a little tiring after a while, but we finally got away.

The next day, my face was all over the front page of the papers. Phones rang all day asking for interviews and TV appearances. Mistress was just thrilled! "Oh, we must celebrate," she said. "I'm going to take



you to the "Golden Door for Gorgeous Cats!" (You know that's the last word in beauty parlors). And what do you think they did? Yes, you guessed it -- they dyed me pink. So, now I'm known all over the world as the Supersonic Pink Pussycat. And you know, my dear, Supersonic Pink is the In color this year!

SUGGESTED FOLLOW-UP ACTIVITIES
Supersonic Pussycat

1. Can you draw a picture of Marita before and after her supersonic flight?

2. As a news reporter, interview Marita about her new experience.

3. Draw a picture of the plane on which Marita flew. What kind of plane did she fly on last year?

4. Make a list of the different kinds of figurative language used in the story.

5. How do you think her life changed after Marita's supersonic flight?

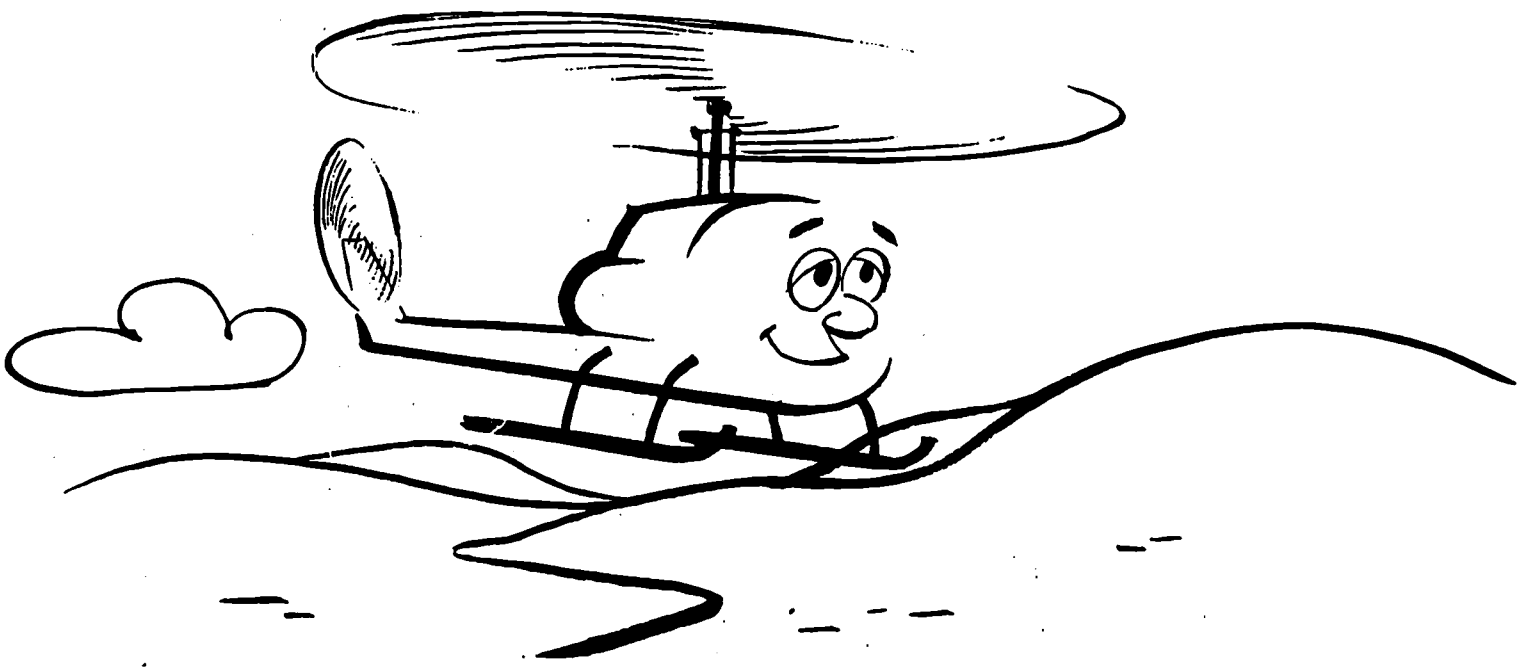
6. What do you think Mistress was like?

S H A K Y T H E H E L I C O P T E R

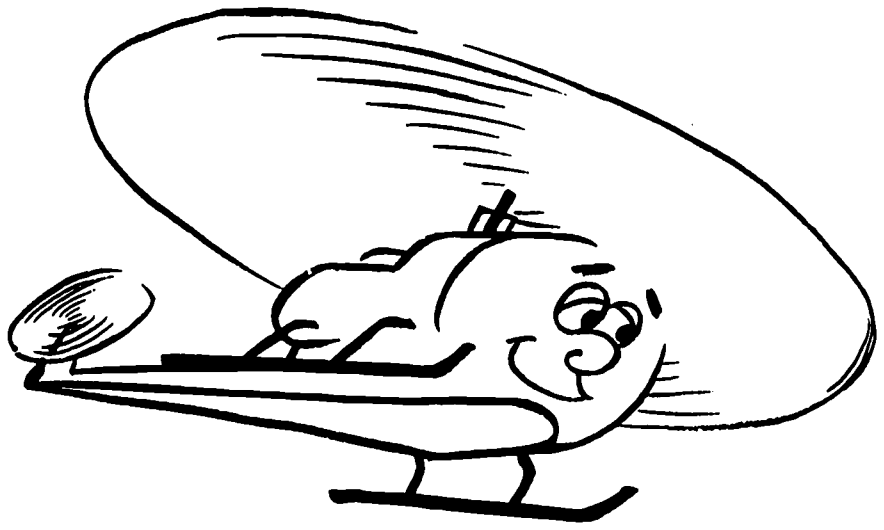
"How-w-dy, folks! Shaky is my name and I'm a ring-ding whirlybird of the West. Step right up but watch my blades for I'm a multi-fisted, hard-biting chopper. Now, settle yourself in the saddle for it's lift-off for Disneyland aboard the flying horse of the air range. We'll get that windmill going and we'll be there in fourteen minutes flat."

"What's that? You say I'm shivering and shaking and you can't hear what I'm saying? Well, stifle my rotor! We can't have that for I've got a story to tell."

"But you didn't know I was first designed by an artist -- a paint-slinging hombre named da Vinci. And, that was 'way back in 1500. Guess his imagination galloped ahead of his partners because it sure did take them a long time to think about me."



"Man, you should see some of my ancestors! Real curiosities, they were! Now, my age is approaching twenty-nine and with this fast whirling, high-flying life I'm living, I'm afraid I'm coming apart at the seams."



"Oh, shucks, now folks, don't get scared. I'm only kidding. Don't you know I'm the safest way to go? Why even if those rip-snorting engines quit, we'd be able to autorotate. We'd bite the dust with hardly a jolt. You see, I'm just about the safest vehicle afloat."

"I've always been the adventurous kind. Even when I was just a young bird I'd try anything. I'd go straight up and down for take-offs and landing and maneuver to the East, West, North and South. I'd hover steathily in mid-air and make a lasso out of my cargo sling for pick-ups and drops when things got too crowded down below."

"Herding cattle and riding the range is not all I'm good for. I've seen action with the Coast Guard, the Forest Service Air Patrol, the military, and even the U. S. Department of Agriculture. From the wastes of Goose Bay, Labrador, to the rugged Red Rock Mountains my reputation continues to grow. (You can put away those six-shooters, friends. I'm the 'good guy', you oughta know.)"

"I think we've been spotted. There's Disneyland below, but if you'll keep a tight lip I've a last confession to make. Though I'm regular 'eye in the sky' and have more uses than a pocket full of rockets, I've heard about those fast operators of the super-

sonic age. That's what I think I'd like to be."

"Hold on there, folks! Don't mind my clattering bones. We'll rotate in slow. Hope you'll make this trip again. It should be quite a spin if I get that new ram-jet engine I've heard talk about. So be sure to ask for 'Shaky' - the wildest bronco of all."

"All out for Disneyland!"

"How-w-dy, folks . . . ."

SUGGESTED FOLLOW-UP ACTIVITIES

Shaky the Helicopter

1. What can you find out about Shaky's ancestors? Who designed them? When? What did they look like? How well did they fly?

2. Draw a picture of Shaky during one of his adventures.

3. What did Shaky mean by stifle my rotor, rotate, autorotate, and ram-jet?

4. Why do you think Shaky talked so much? What kind of character does he represent?

5. What was Shaky's secret desire? Do you think a ram-jet engine will help?

6. How many fast operators of the supersonic age can you name? Make a collection of their pictures from newspapers or magazines - or draw them.

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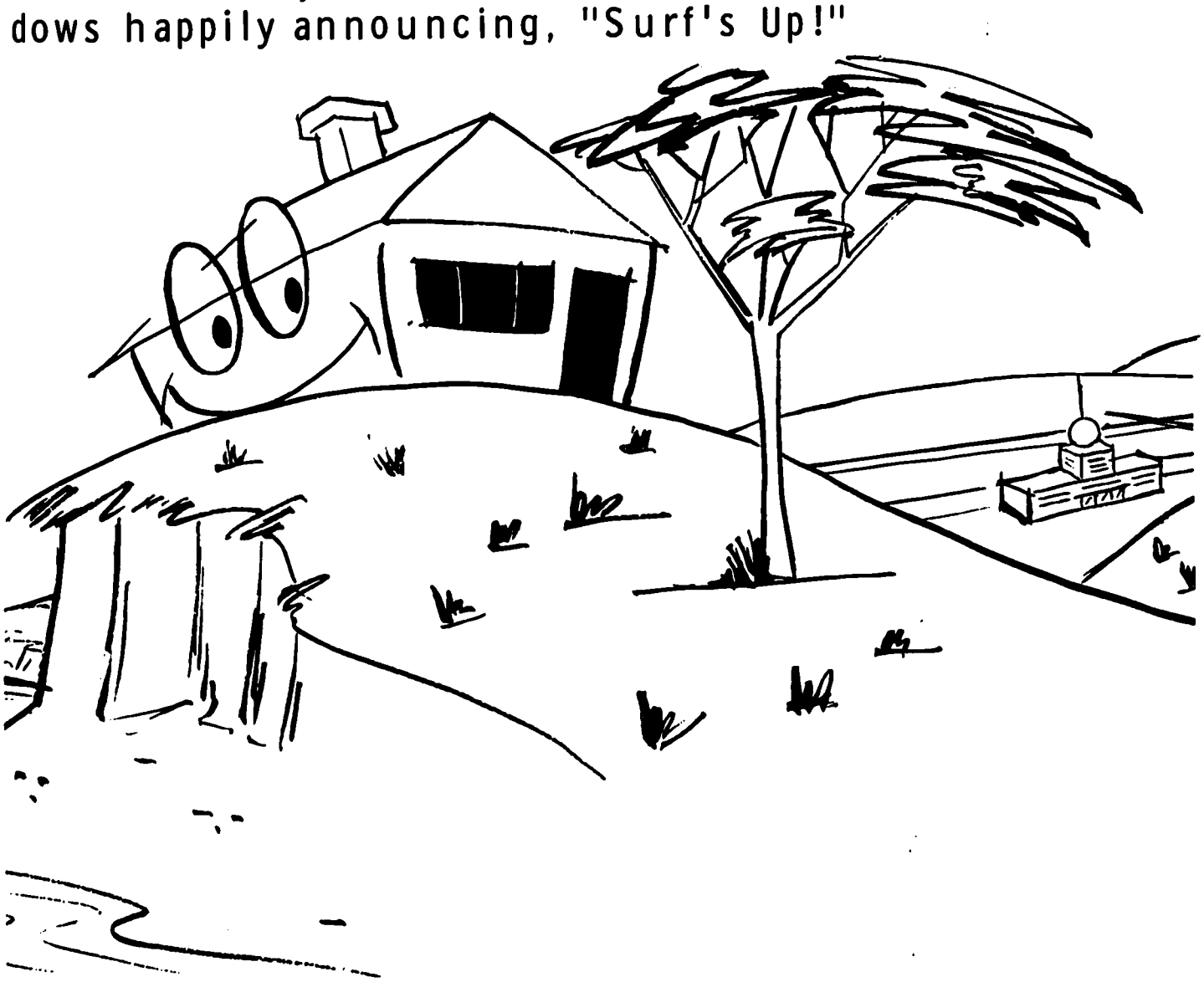
THE HOUSE THAT HAD TO MOVE

(Sound effect of jet engines)

There's that noise again. Oh, my chimney ached! My boards and joints creak and sag, and my walls are falling down. And to think I'm only ten years old.

I wasn't always in this condition. It wasn't too long ago that I selected this beautiful site overlooking the Pacific Ocean for my home. All I could hear was the lapping of the ocean on the beach, the murmuring of the wind through the palm trees, and once in a while the squawk of a gull seeking his dinner - the voices of young people drifted through my windows happily announcing, "Surf's Up!"



Then one day (Repeat sound effect of jet engines) and my world was turned upside down. My quiet days came to an end. Peering down my hillside I saw many men and trucks arrive to lengthen the runway of my neighbor, The Airport. Day in and day out the sounds I love were drowned out by noisy machines - closer and closer it came - a wide black path approached my door bringing (sound effect of jet engines) jets, jets, and more jets - beautiful to see but, oh, what noise. No sleep at night, no rest during the day - something had to be done! My neighbors were weary and so was I.

What could we do? Our airport friends came to see us. They wanted to help. So all the neighbors gathered on the beach to learn that our land was needed. The airport neighbors explained to us the need for a buffer zone and that we need a quiet place to live. So it was decided we had to move.

Today the movers are coming to take me away. Now the airport has room to grow. More jets can do their job of helping people travel. Already I can hear the happy sounds I love.

SUGGESTED FOLLOW-UP ACTIVITIES
The House That Had to Move

1. What do you think the house looked like before and after it was moved? Can you draw it?

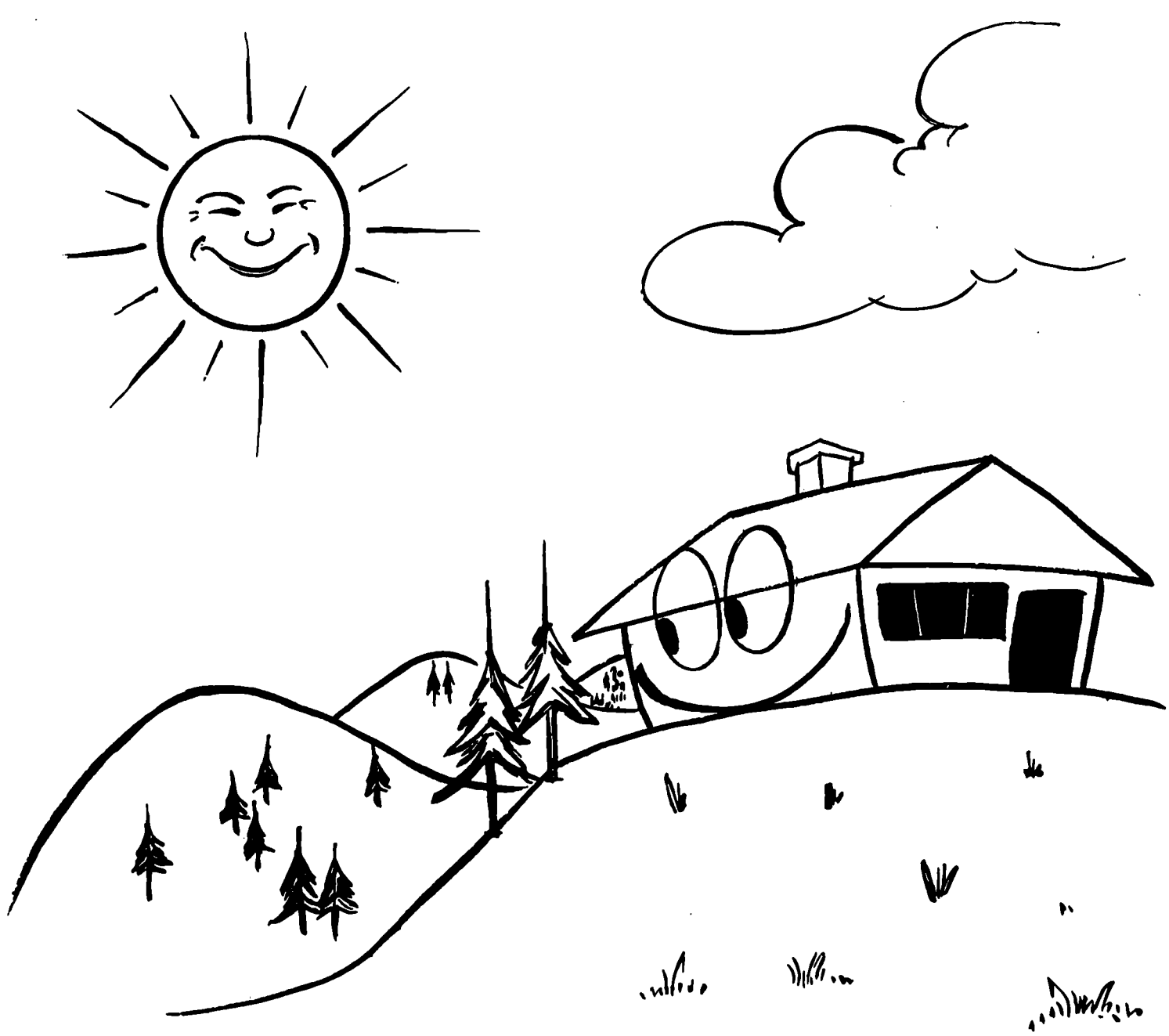
2. What might the house look like if it hadn't been moved?

3. What other sounds could the house hear?

4. Make a list of the sounds you think the house loved and the ones you think bothered it.

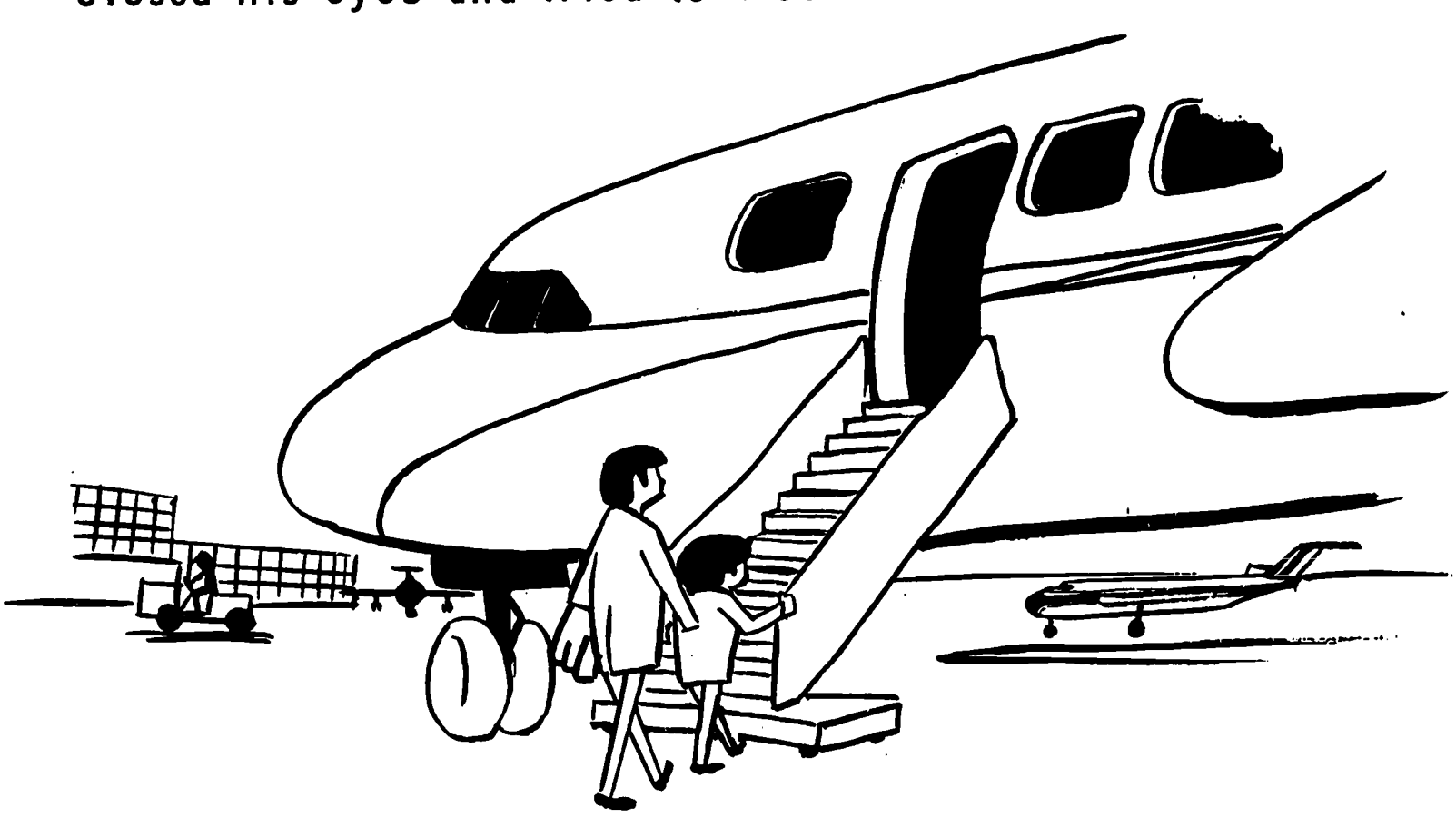
5. How do you think the new expanded airport will look after all the houses have been taken away? Can you draw it?

6. Can you write a story about the family that lived in the house that had to move?



JAMIE TAKES A JET

Jamie lay there in his pajamas wide-eyed and excited. It seemed hours since he had gone to bed, but sleep would not come. Over and over he told himself he must go to sleep so that he would be fresh and rested for tomorrow's flight to Los Angeles. He wondered what it would be like to fly by jet. Would he be able to look down and see the rivers and towns and maybe even the Grand Canyon? And his father had promised to take him along when he drove on to Edwards Air Force Base in the Mojave Desert. Jamie closed his eyes and tried to visualize the desert.



Mornings come hot and sultry in Washington, D. C. in the summer and this one was no exception. Jamie awoke with a start and sleepily struggled to identify the reasons for his feelings of enjoyment and excitement. Then he remembered. He leaped out of bed and hastily put on his clothes.

Downstairs, his family was noisily finishing breakfast. Jamie obediently ate his toast and kept an eye on his five year old sister, Judy, while his mother and father completed the packing and stowed the luggage into the back of the station wagon.

It was a long drive to Dulles Airport. Jamie sat tight against the car door and as far away from his sister as possible.

"Mom," Judy said, bouncing up and down on the edge of the seat. "Is Jamie going on a jet?"

"Yes. A jet. All the way to Los Angeles."

"Why can't I go?"

"I've already told you, Judy. Mother would be lonesome without Daddy and Jamie. I need you here to keep me company."

"Will they come back soon?"

"Yes. Very soon. Maybe later on Daddy can take you someplace on a jet."

"When, Mom? Will Daddy take me when he gets back from Los Angeles?"

Jamie did not hear his mother's reply. They were nearly at the airport now and he could hear the whine of the jet engines as they warmed up for take-off. He glanced at his father and wondered if he was excited too. I'm glad we're here, he thought. I couldn't have waited a single minute longer.

Dulles Airport, the sign said, and his father turned to his mother. He said, "Why don't you park the car? Jamie and I will check in."

The air was cool as they walked inside the lighted terminal. It seemed almost unreal to Jamie and he concentrated on matching his stride to that of his father as they purchased their tickets.

The had left the house at the last possible moment and there was no extra time at the airport. The flight was called just as his mother and Judy came in from the parking lot.

"Will you call me when you reach Los Angeles?" she asked.

"All right," Jamie said. "I'll miss you, Mom."

The flight call came, loud and distorted over the public address system.

"Well, good-by," Jamie said, unable to decide whether it would be proper for his mother to kiss him.

"You'd better go if you want a window seat," she said, bending to give him a quick hug. "Do what your father says. I'll see you soon."

Jamie and his father found seats near the wing of the plane and fastened their safety belts. Jamie could feel the vibrations of the motors as they began to taxi down the runway. The ground outside the window seemed to flash by and Jamie felt the slight tug as the plane lifted. Soft music was playing as they rose higher and higher. The houses below reminded Jamie of the houses in his Monopoly Game. Still they climbed. Jamie could see the clouds just outside his window now and he felt separated, isolated from the earth below.

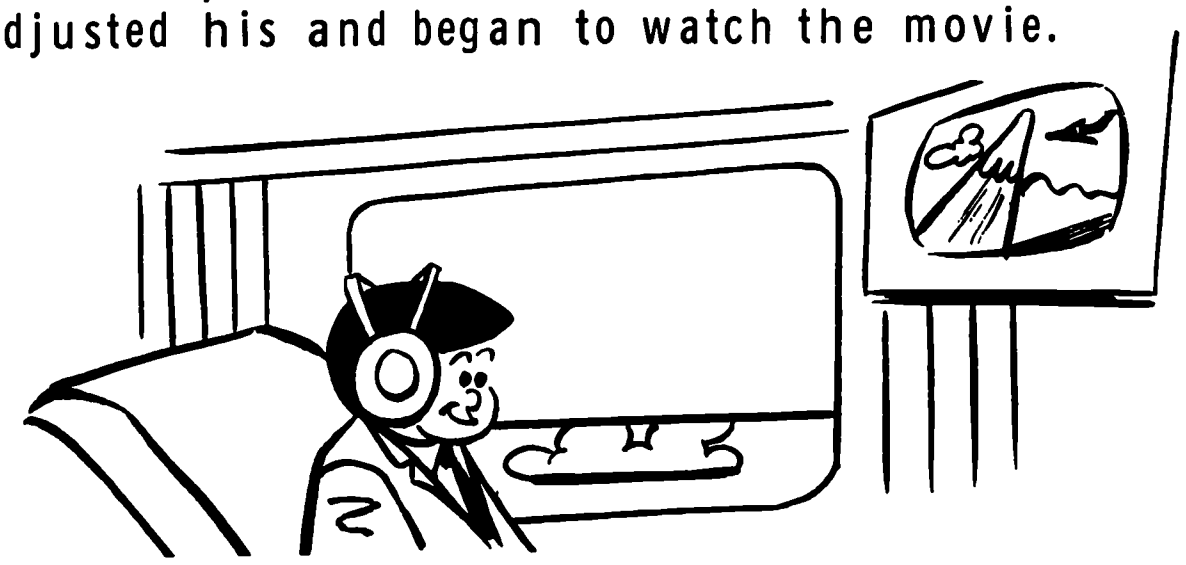
"Ladies and gentlemen, this is your captain speaking on transcontinental flight 55 from Dulles International Airport. Our flying time will be approximately four hours and thirty-two minutes. We will be flying at an altitude of 31,000 feet. Welcome aboard!"

The stewardess came down the aisle swaying, surefooted. "Would you like something to drink?"

"No, thank you," his father said. "Nothing for me, but you could bring a coke for Jamie."

Fascinated, Jamie watched her walk down the aisle and return with his drink. She walks, he thought as though she was completely unaware that only a thin skin of metal and thirty thousand feet of air separated her feet from the ground. He turned back to the window. Now he could see nothing but clouds floating lazily in a turquoise sky. The plane hardly seemed to be moving at all.

Just then the stewardess returned with their lunches. Jamie was hungry and ate his quickly. His father explained how to use the headset and Jamie adjusted his and began to watch the movie.



From time to time he glanced out the window, but they were nearing Los Angeles before he was able to see anything below. He was surprised at the difference in the landscape now. The hills looked black and he was sure the great barren stretches of land must be deserts. Roads, solitary and deserted, wound among the hill tops. Great crevices split the flat land below. Again, he wondered if he could see the Grand Canyon. He wanted to ask, but he could not see a stewardess and his father seemed to be asleep. He sat back and tried to concentrate on the movie.

At last the movie was over and the stewardess instructed them to fasten their seat belts as they began the descent. The city was just below them now. It seemed to take a long time to come down, Jamie reflected. The city stretched in all directions below them. They were coming down rather rapidly now and the quiet gave way to the excited chatter of the passengers. Jamie felt the slight bump as they touched down and then his father was guiding him toward the terminal.

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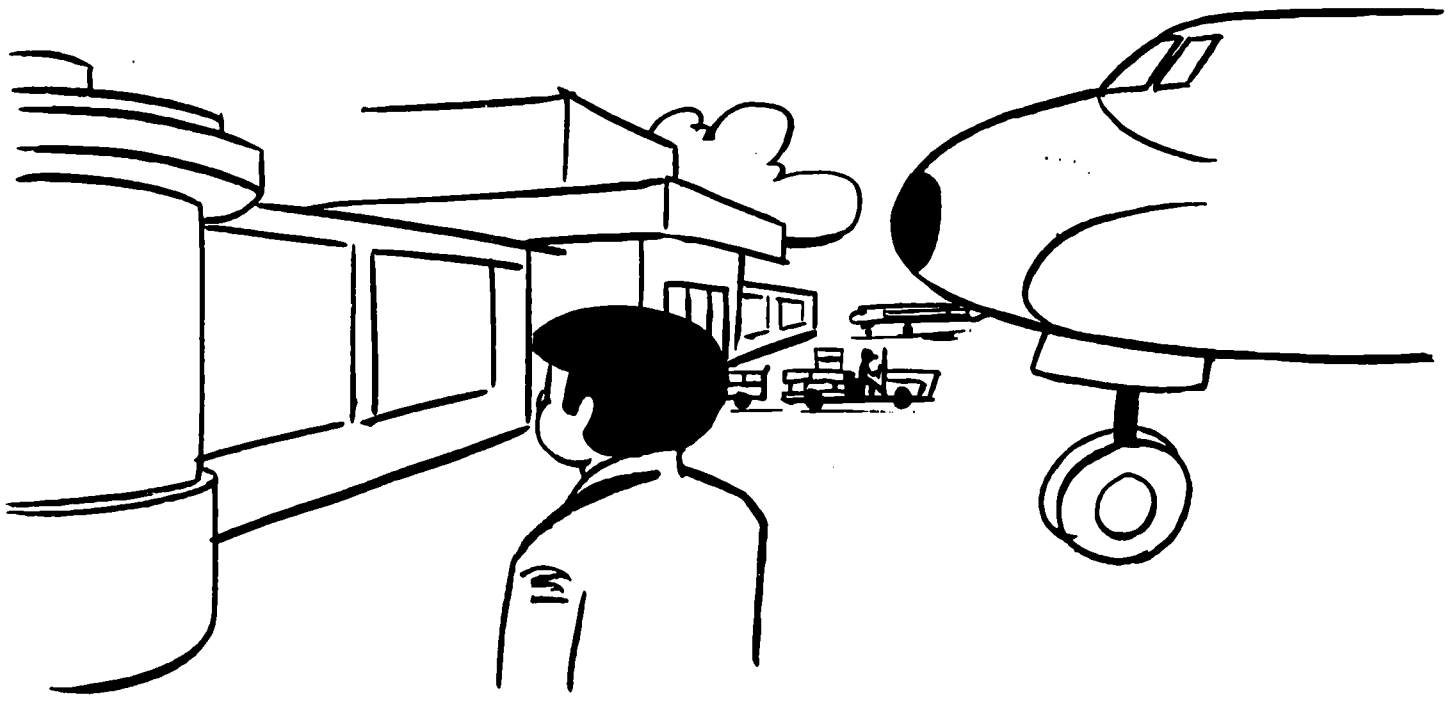


The air was damp and smelled of the nearby ocean. The Pacific Ocean, Jamie reminded himself as they moved past the bustling crowds inside the terminal. Jamie felt a growing sense of wonder that he was there, that it had actually happened, that he had flown 2,286 miles and was now in Los Angeles. He caught his father's hand and smiled up at him as they began to edge their way to the sidewalk.

SUGGESTED FOLLOW-UP ACTIVITIES
Jamie Takes a Jet

1. How would you feel if you were Jamie? How did his face look on different occasions? Draw a picture of him.

2. Can you draw what you think Jamie saw from the plane as he neared the Los Angeles airport?

3. Draw a picture of the inside of the aircraft.

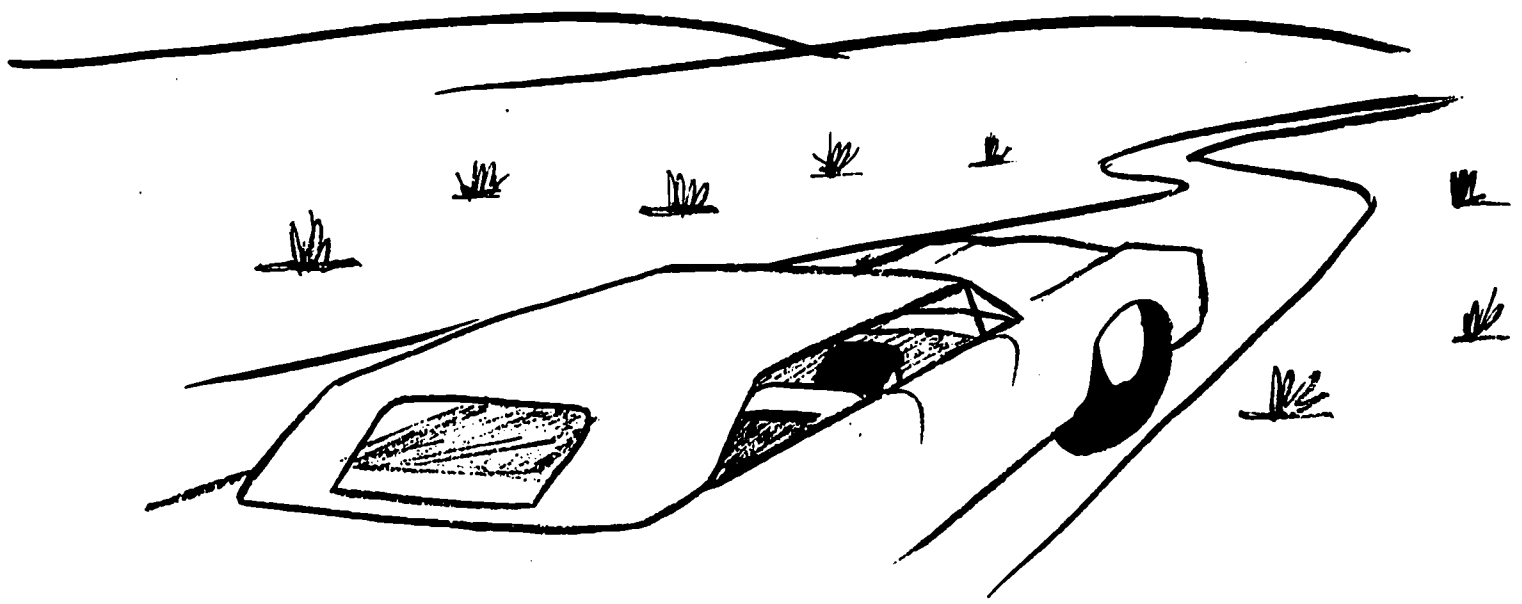
4. What did Jamie see as he deplaned?

THE BOOM IN THE DESERT

Jamie and his father drove slowly eastward on Santa Monica Boulevard. The freeway was already crowded with the cars of inbound traffic. It was going to be a beautiful day, Jamie decided. A brisk wind had scoured away the smog and sent fleecy white clouds scudding across the blue sky. Jamie put his head back against the seat and looked up watching billboards and buildings flash by. They drove in silence, stopping only once to eat breakfast in a roadside coffee shop.

At San Bernardino they turned toward the mountains and began to climb. Gradually the air lost the ocean-borne dampness of the coast and became drier and balmy with warmth. Jamie relaxed and was considering the possibility of a short nap when he became aware of the sound of a dull boom. He glanced toward his father, but Mr. Collins was intent upon his driving and seemed not to notice.

The road began to narrow now as they neared the broad, flattened land of the desert. All around him Jamie could see the pale beige sand, knotted here and



there with low bushes. Even the colors of the few houses they passed were delicate as if faded by the sun. At the edge of the desert was a pasture, tinged a faint green, and a couple of horses stood flicking their tails. Just beyond the pasture a sign said "Edwards Air Force Base -- 14 miles." Glancing at the clock Jamie noted that they had been driving for almost two hours.

They made a right turn at the sign and the road seemed to stretch onward endlessly. Now there were no houses at all and the immense silence of the desert was broken only by the sound of their automobile.

They drove on silently.

Soon they could see the low-lying complex of buildings that make up the Base.

"You're quiet today, Jamie", his father said. "You okay?"

"Yes. It's very different, isn't it?"

Before his father could reply, he heard it again. The dull booming sound he had heard before. Jamie sat up very straight and glanced at his father.

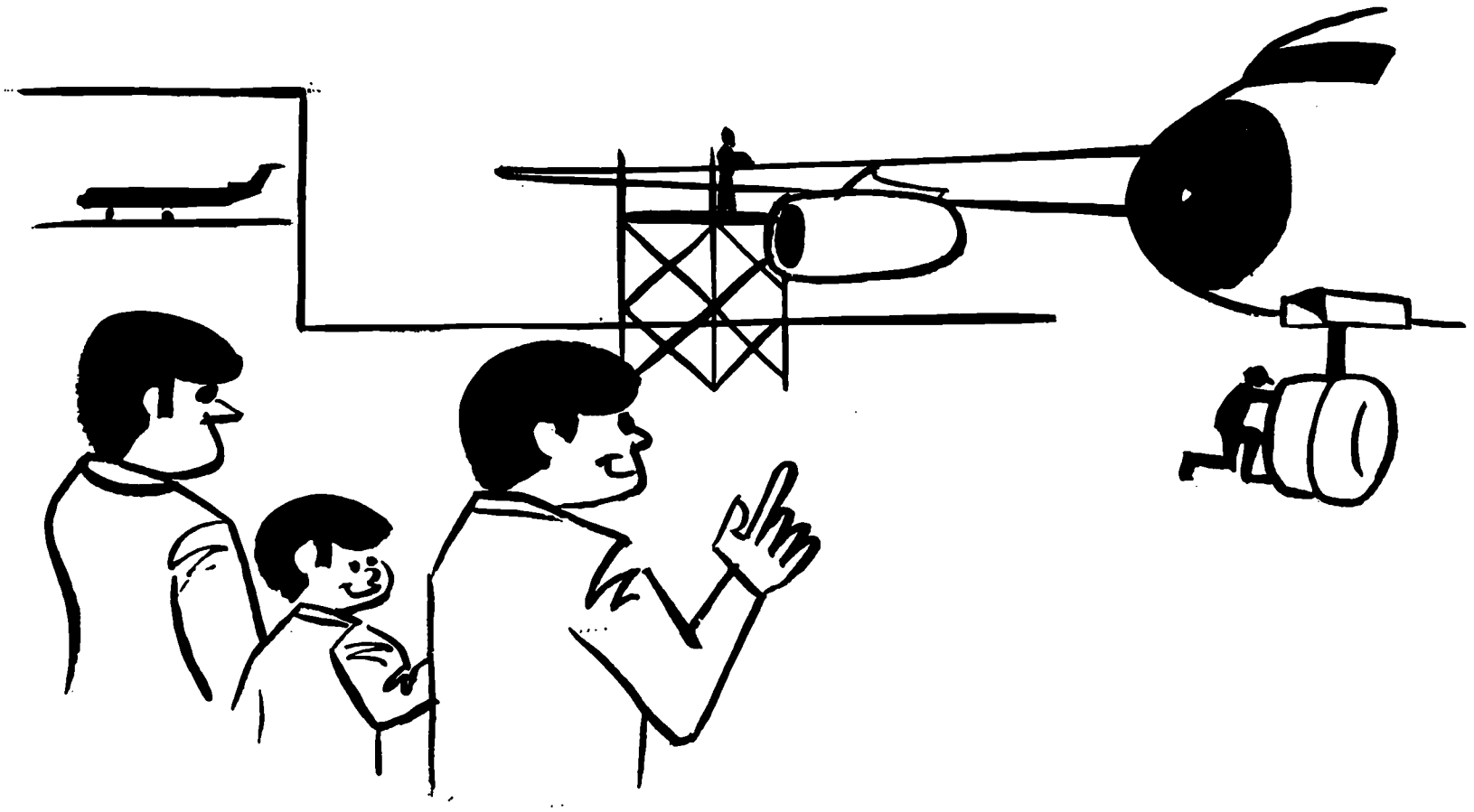
Mr. Collins smiled. "That was a sonic boom, Jamie. You'll be hearing a few more of them today. Did it frighten you?"

"No. I guess it surprised me, though. What causes it anyway?"

His father parked the car and they began walking toward the building before he answered.

"You see, Jamie," he began, "sound travels in waves much like the waves you see when you toss a rock into the lake. When an airplane exceeds the speed of sound, a kind of shock wave is set up by each projection on the plane. All these small shock waves coalesce or move together into a common end field. By the time it reaches your ears you hear the sound we call sonic boom. While we are here today, we can see some of the tests being done with sonic boom."

They walked on toward the registration desk. Security regulations at the base required a visitor's pass and an escort to the testing shacks. Mr. Collins signed them in and they were introduced to Mr. McLeod who was to be their escort. He led the way down the hall and through a hangar where several planes were being checked.



Jamie wanted to stop, but Mr. McLeod led them outside the hangar. Although the sun was dazzling a brisk, cool breeze kept them surprisingly comfortable. They moved on toward a nest of trailers off the right of the field. When they reached the trailer area, Jamie saw several wind protectors on the ground located about five feet apart. Each had a cable leading into the nearby trailer.

Mr. McLeod stopped and raised one of the wind protectors. Jamie could see a flat board about three feet square with a small stake in each of its four corners. Rubber bands attached to the stakes held a microphone suspended above the board. The cable was attached to the microphone.

"Sonic booms have various strengths," explained Mr. McLeod. "When we need to measure them, we place these microphones around the field to pick up the sound. This protector keeps out the sound of the wind which might distort the measurement."

He replaced the wind protector and called our attention to the cable.

"This carries the sound to an amplifier inside the trailer," he said. "The amplifier sends the sound to a machine called an oscillograph. In a few minutes you will be able to hear a boom. Come inside the trailer and you can see how it works."

Jamie and his father and Mr. McLeod crowded inside the tiny trailer. Through the open doorway, Jamie looked in the direction pointed out by Mr. McLeod as the supersonic corridor. A tiny speck moved slowly into view leaving a thick white vapor trail behind it.

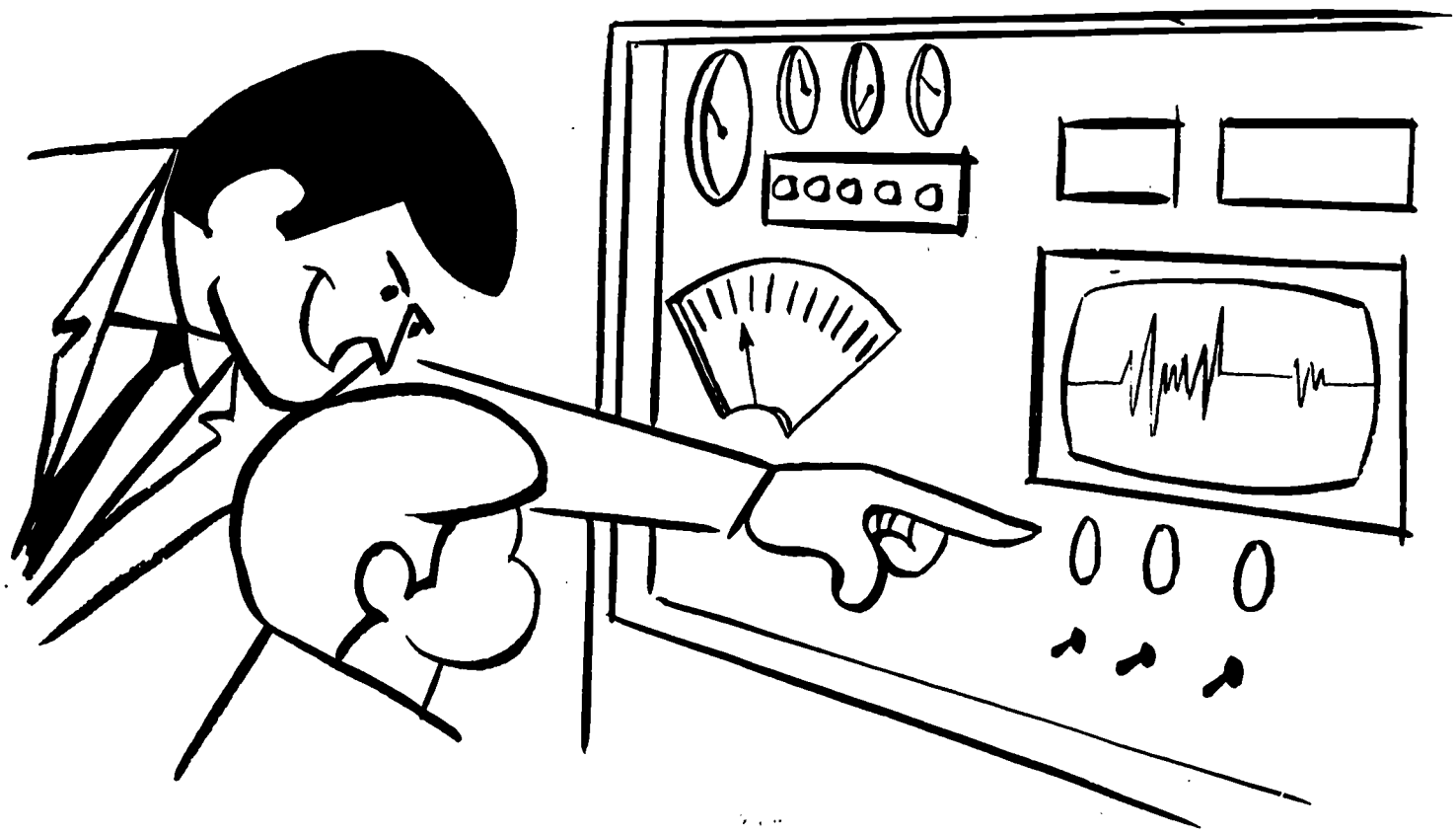
Mr. McLeod switched on the machine. The machine hummed as paper passed underneath a small lever. A small, almost straight, line was drawn across the paper. Jamie watched the lever intently. Within seconds they heard the boom -- a soft, dull thud. The needle jerked against the sheet and leveled off again.

"That was a softie," Mr. McLeod said as he switched off the oscillograph and tore the sheet out for them to see.

Sure enough, there it was -- the boom signature looking like a small sharp mountain on the write off sheet.

Mr. McLeod squinted at the sheet. "About one pound overpressure," he commented. "That was a light one!"

Jamie was fascinated. "Why are some booms stronger than others?" he asked.



"Well, a great many variables affect boom strength, Jamie. The air pressure, air turbulence, the size and altitude of the plane. All these must be considered in measuring the strength of a boom," answered Mr. McLeod. "Some things seem to increase the force of the boom -- the heaviness of the wing and the angle of attack, for example. Other factors such as heat from the ground can dissipate the boom."

Mr. McLeod closed the trailer door and they began walking toward the main building. Jamie was lost in thoughts of boom strength, overpressures and Mach numbers as his father signed them out.

Finally at the door, Jamie turned and said, "Mr. McLeod, how can you ever be sure of the strength of <u>any</u> boom?"

Mr. McLeod laughed. "It's difficult, Jamie," he admitted. "The boom signatures are sent to the lab where they are analyzed and computed mathematically. Maybe you can visit us again and see that phase of it."

"Maybe," said Jamie. "Maybe someday."

SUGGESTED FOLLOW-UP ACTIVITIES
<u>Boom in the Desert</u>

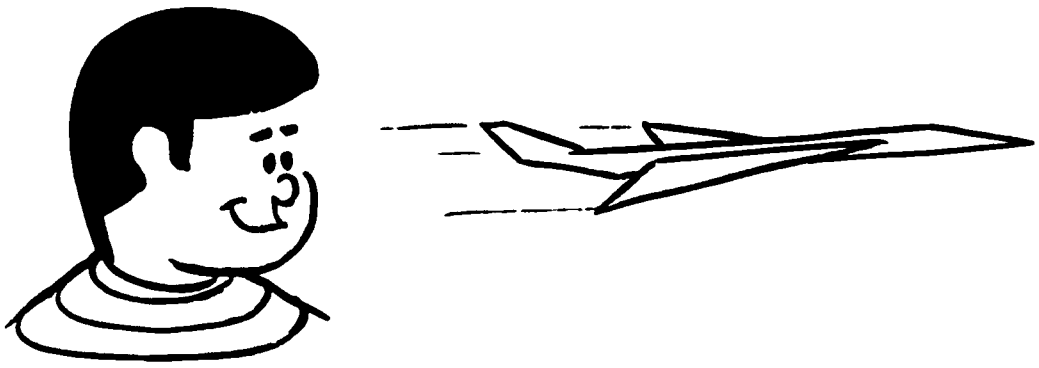
1. What do you think Jamie felt and what did he do when he heard the first dull boom?

2. Though the desert seemed barren and silent to Jamie, what could he have seen and heard?

3. Can you draw a picture of the airplane hangar that Jamie saw? What were the men doing inside?

4. Can you draw what you think Jamie saw when he was told to notice a tiny speck in a supersonic corridor?

5. What might Jamie have done if he heard a boom of 10 or 20 pounds overpressure? Can you draw his reaction?



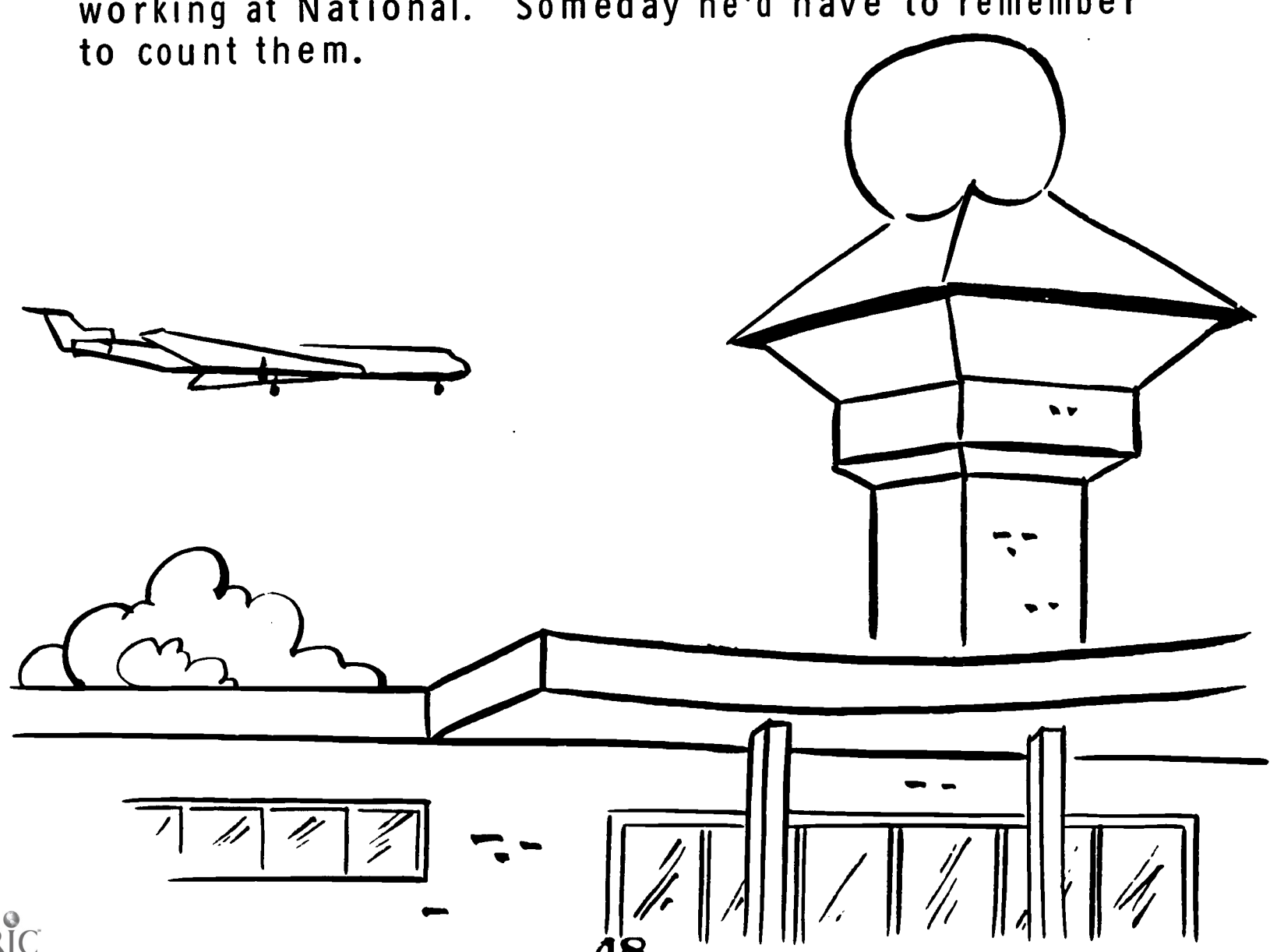
D A N G E R O N T H E R U N W A Y

When the jangle of the telephone woke Jim Borden at five AM, he knew his plans for a relaxing day of fishing were off. It always seemed to him that the phone had a different sound when the call meant extra work. Groggily he answered and heard the voice at the other end say he was needed on the seven to three o'clock shift. Jim was an air traffic controller at National Airport and overtime work had gotten to be a regular occurrence. The thought that he might play sick flashed through his mind, but he knew his conscience wouldn't permit that kind of business. However, there were no rules on complaining so Jim spent the next hours sleepily muttering to himself.

Driving along the Parkway, the early fall morning sights escaped Jim's notice for he was still reflecting on how he'd ever gotten into such a ratrace job. Certainly he'd known in advance about the responsibilities and pressures. He'd spent a couple of years in army aviation during Korea, and after his discharge he knew he wanted to stay in some phase of aviation. When he applied for training in air traffic control, he was put through some pretty arduous testing before being accepted. Then followed three years of instruction and supervised work before he was allowed to handle the job alone. When the planes began to stack up in the taxi-ways and overhead, he said a silent "thank you" for the detailed training. He knew how to keep his cool and deal with the issues calmly and logically.

By the time Jim parked his car his normal good humor had returned and the disappointment over no fishing had vanished. The sight of the airport never ceased to excite him. He couldn't help but marvel at man's flying creations - the long, sleek bodies that began on the drawing board and ended in the sky loaded with passengers and cargo reminded him of the important role he played in their daily tasks. Then Jim knew beyond a doubt that regardless of overtime, heavy responsibility, constant pressure and various other complaints, he was proud of the job he had chosen.

Wasting little time now, Jim quickly began the long climb to the tower. He wondered to himself how many steps he'd climbed in the five years he'd been working at National. Someday he'd have to remember to count them.



Entering the small tower room, he took the only moment he'd have for the next eight hours to admire the view. Washington always had a golden glow in the early morning sun, and the Potomac lost its usual murky look as small waves picked up glints of sunlight. The distant scene faded though, as Jim's attention focused on the job at hand. With 40 scheduled flights and numerous unscheduled ones, there was no time for panorama gazing. After a short briefing from his friend, Frank Howell, Jim slipped on the ear phones, picked up the mike, and his day officially began.

EASTERN 701 - CLEARED FOR TAKE OFF.

EASTERN 701 - ROGER

Seven hours later Jim's legs had a familiar ache and a general weariness was creeping through his body. He knew skipping lunch was a poor practice, but he seldom had time to do otherwise. Only an hour to go and then he could relax.

Out on the runway a prop-job and two jets with a Cessna sandwiched between were waiting for take-off instructions. Jim was in the process of giving final landing instructions to a Delta 727 when he made a quick scan of the horizon and sighted a V-shaped spot flying southbound.

WASHINGTON TOWER, THIS IS DELTA 64. 7 MILES OUT ON FINAL. REQUEST LANDING INSTRUCTIONS.

DELTA 64 CLEARED TO LAND RUNWAY 36. WIND 360 DEGREES AT 9 KNOTS

DELTA 64. ROGER

52

The spot on the horizon was taking shape and Jim recognized it as a flock of ducks flying in perfect formation. From their position, Jim suddenly had a premonition that this formation might create a problem not covered in the books. The ducks appeared to be headed straight for the north end of runway 36. Jim made an approximate estimate of their altitude and received a real jolt. Those brazen birds were no more than 1000 feet high and losing altitude rapidly. If they continued their present course and maneuvering, he knew he had a problem.

Jim grabbed the telephone and made a quick call to the safety section, giving them the information that trouble might be brewing. Then he notified the pilot of the 727.

WASHINGTON TOWER, THIS IS DELTA 64 THREE MILES OUT.

DELTA 64, THIS IS WASHINGTON TOWER. ROGER. WATCH FOR A FLOCK OF DUCKS OFF THE LEFT SIDE OF THE RUNWAY -- NOT SURE OF THEIR COURSE BUT BE ALERT.

DELTA 64. ROGER

The 727 was in sight now and the ducks were clearly visible at the other end of the runway. The radar scope in the tower revealed collision attitudes. On the ground, the word had spread and amazed eyes began to scan the sky. The fire truck and ambulance were in ready positions, and all other flights were held in place. The airport geared itself for trouble and waited.

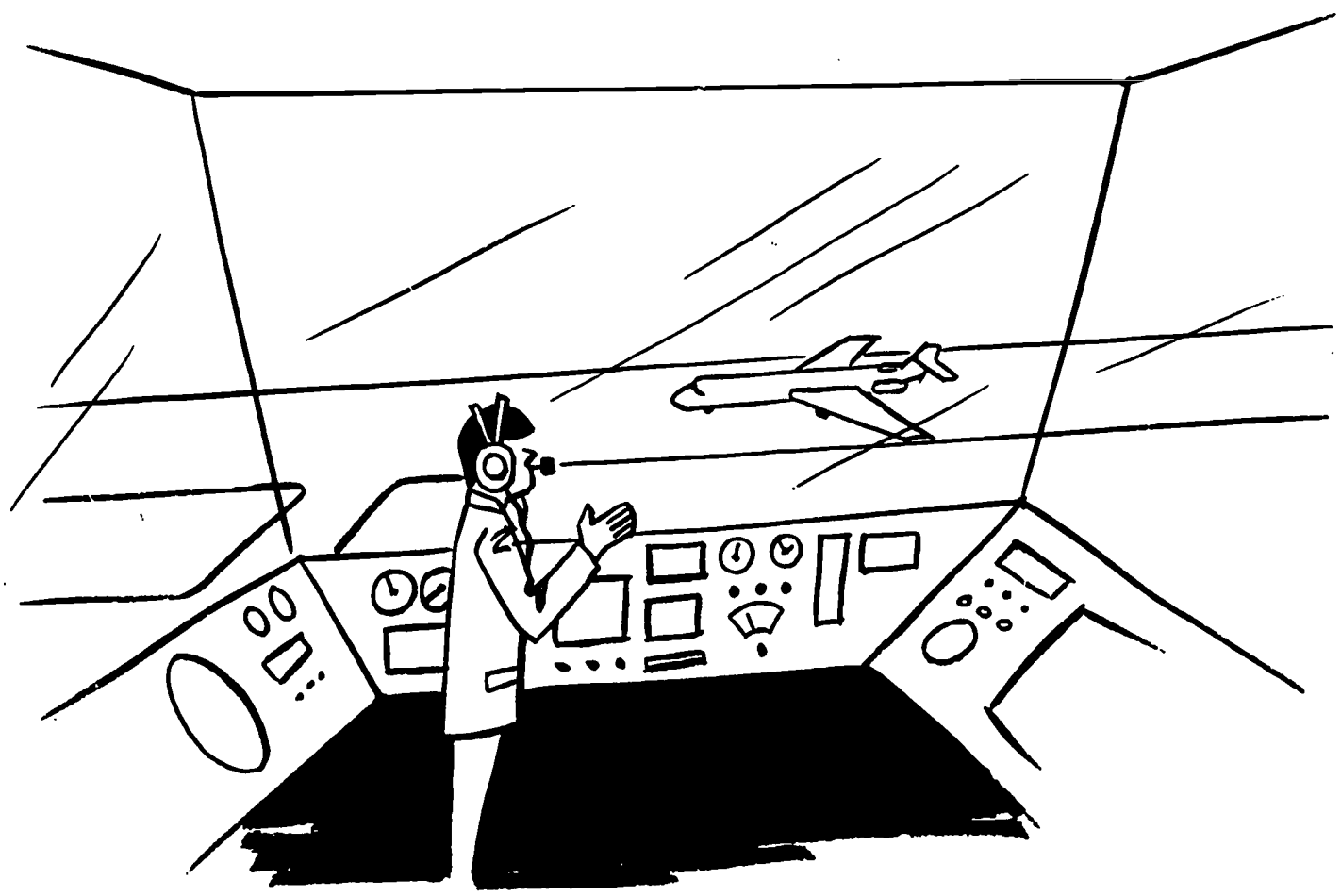
The big plane roared to the end of the runway -- its wheels heating up the concrete as the pilot cut his power as rapidly as was safely possible. The duck leader was oblivious to the stir his actions were causing as he quietly swooped downward with followers behind.

Closer and closer plane and ducks came -- one great metal bird facing 25 small feathery ones as in a jousting tournament -- the copy versus the original, but no contest here. There could be no winners if they met. The radar scope showed the narrowing distance. The usual bustling, noisy airport now actually seemed quiet. The only sounds to be heard were the steady honks of the ducks and the shrill whistling of the jet engines.

Jim felt like he had lived a life time in the few minutes since this unreal situation started. Now it

was reaching a climax. There was not time to think about whether or not the right decision had been made. At the moment it seemed the only one available, but Jim knew that later he'd think of dozens of different ways of handling the problem. If there was a collision - well, he just couldn't face that now. Things were happening too fast.

In a flash, midpoint on the runway, the confrontation came, and a sigh of relief from the anxious spectators masked the sounds of plane and ducks. Just when they thought a head-on crash was certain, the formation of ducks gracefully nosed up enough to barely clear the top of the big jet. In the tower, Jim and the other controllers with snaky knees and sweaty brows quietly took off imaginary hats to two courageous pilots.



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SUGGESTED FOLLOW-UP ACTIVITIES
Danger on the Runway

1. Draw a picture of Jim as he directs air traffic from the control tower.

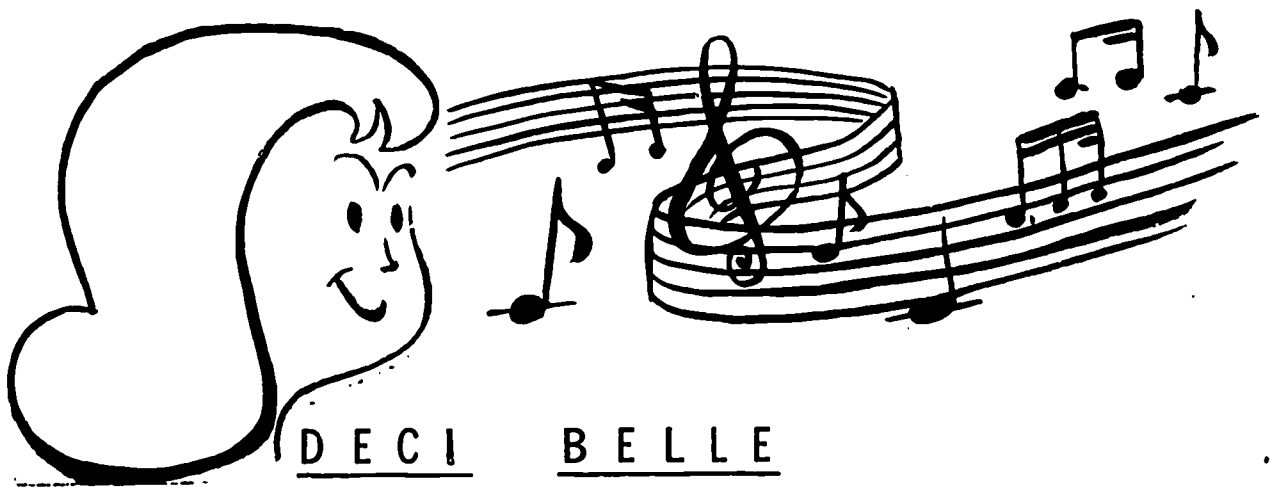
2. Draw a picture of the airport when Delta Airliner and the ducks arrive.

3. What are some of the other ways that Jim might have solved his problem?

4. When the airliner landed safely, how do you think the pilot felt? Draw a picture of him.

5. Define the following words:

traffic control	Cessna
groggily	premonition
arduous	jousting
taxi ways	maneuvering
unscheduled	confrontation
prop-job	radar
horizon	



DECI BELLE

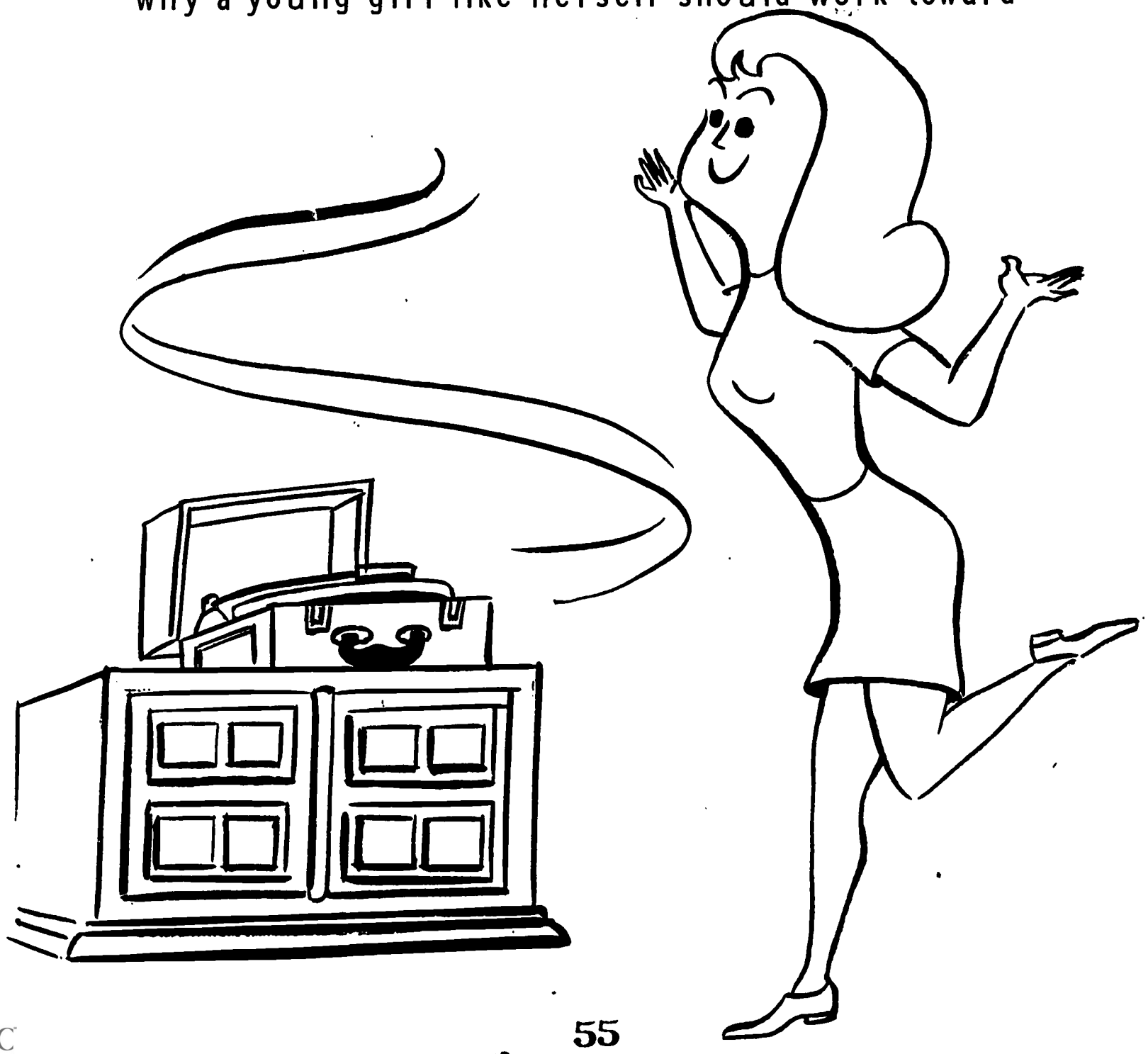
"I don't want her - you can have her, she's too noisy for me." That's what the boys were saying about Deci Belle and there was some truth in what they said.

Deci was a smooth chick with good looks and had a big assortment of the right clothes, minis and all! In school she made a good impression on pupils and teachers alike until they stayed around her too long or kept too close to her. Eventually she would become the source of annoyance or uncomfortableness to the ears.

For some reason Deci was attracted to noise -- the louder the better. If there wasn't any around, she would create it. One could often find her at the noisiest locations around town -- at a busy downtown street corner with the rumbling of busses and trucks, the honking of horns, the shrill whistle of the traffic cop. Or she could be found at the airport watching the planes. Hearing the sound waves coming from the confusion of the full terminal building and the loading areas for cars, airline limousines and taxis gave her a thrill. She loved to hear the shrill whine of the jets as they came in for landings or take-off for all parts of this old world.

If Deci Belle was at a big rock and roll dance, she would be the one right against the bandstand listening to the famous "Jet Streams" with their raucous tones and gyrations. She loved the sounds coming from the group much better than dancing with the boys way across the hall from the source of sounds on the stage.

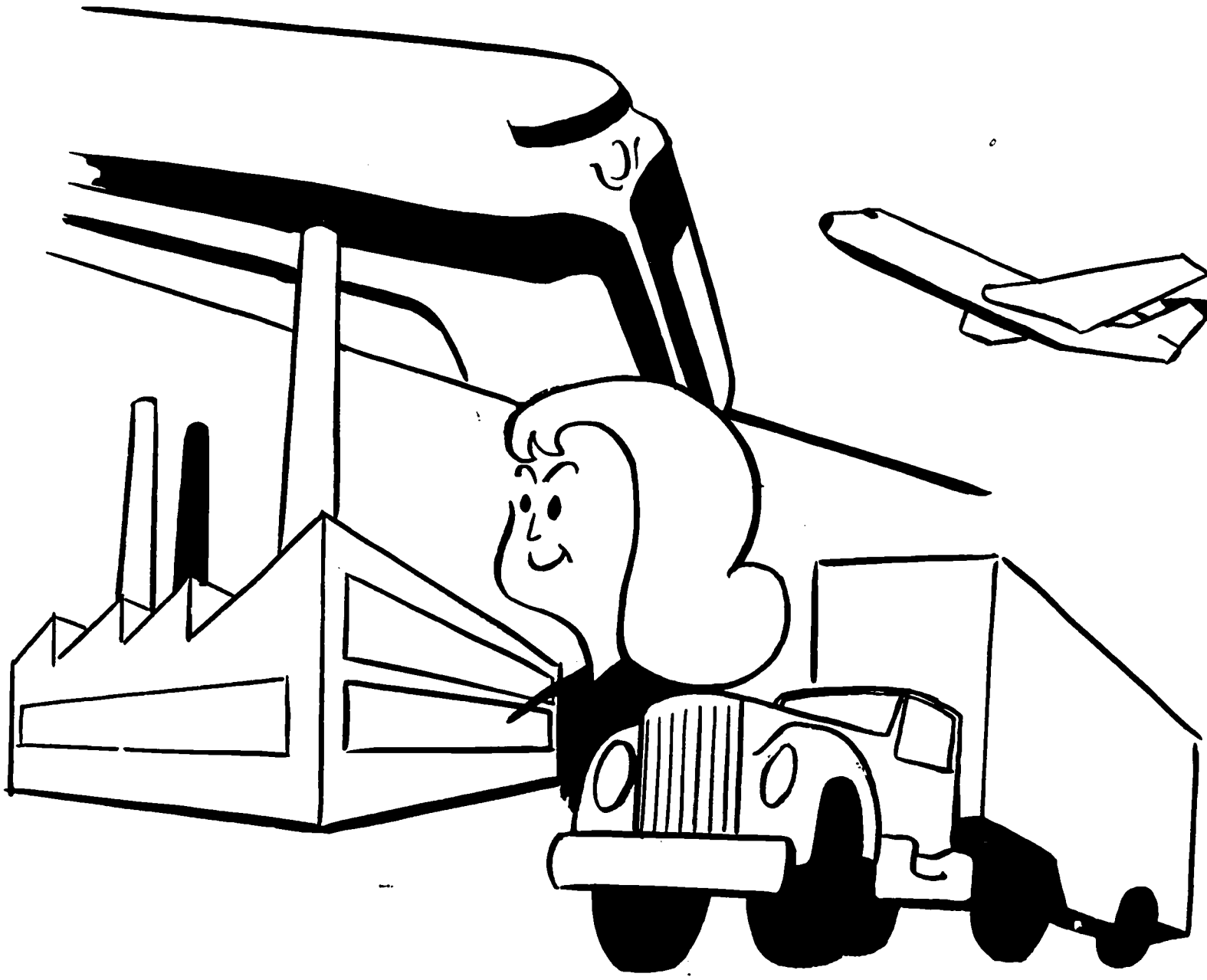
Yes, Deci was a noisy teenager making great adjustment to a noisy world. Her mother and father often tried to counsel her on the need or reasons why a young girl like herself should work toward



becoming more lady-like in her behavior. She thought they just didn't know what was going on. Her teachers tried to guide her along these lines and explained to her how she could be an even better student than she was. But Deci Belle knew teachers just weren't with it. Her best friends (those few who could stand the noise around Deci) tried to cool her but to no avail.

Deci, when she paid attention to unnoise-like things, was a good student. While studying about transportation in a social studies class, she read about the new supersonic airliners being planned for air travel in a few years. She was interested particularly in one problem the developers were having to meet -- the sonic boom. Oh, how she would love to hear one -- a great big loud one!

One day, while riding in the family car with her father, Deci was caught in a traffic jam on a busy city street. This street was along the end of the main runway of the big municipal airport. As they sat there in the car, the noise was terrific! Big trucks and buses with their motors running stood right beside them. Horns were blowing all over the place. Big jets with their noisy engines were coming in one after another right over them. They could almost touch them as they came side by side to land on the dual runways. A big old rattling freight train going along the tracks beside the street added to the terrific non-symphonic sounds. It was scary -- it was up-tight! Oh, if she could only get away from there. Finally, the traffic began moving and as they drove away from the airport, Deci began thinking.



She knew now what her parents, her teachers and her friends had been trying to tell her. Sure, airplanes, particularly, jets were nice, but she decided that when she had a home of her own she would build it far away from the busy airport. Let the factories and railroads and all those things have the land near the airports! She decided there are sounds and there are noises. From this day on, Deci was a changed girl. Oh, she was fun, but she knew there was a time and a place for noise and then only to degrees. She now was more interested in hearing the smooth sounds of what was going on around her -- particularly those coming from the boys.

SUGGESTED FOLLOW-UP ACTIVITIES
Deci Belle

1. Draw two pictures of Deci Belle. One showing how you think she looked at the beginning and one how you think she looked at the end of the story.

2. At the beginning of the story Deci Belle liked noise; at the end sounds. Do you think there is a difference? If so, write a paragraph on noise and one on sound.

3. What part of this story did you like best? Why? Draw a picture illustrating this part.

4. Define:

   rattling gyrations raucous tones non-symphonic supersonic

5. Whom do you think Deci Belle was named after?

6. Which Deci Belle would you like to be, the Deci Belle at the beginning or the end of the story?

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VIII. RESOURCES

A. Books:

1. Alexander, Anne -- "Noise in the Night" -- Rand McNally, 1960
2. Anderson, Dorothy -- "Junior Science Book of Sound" -- Garrord, 1962
3. Bendick, Jeanne -- "First Book of Airplanes" -- Watts, F. -- 1958
4. Branley, Franklyn M. -- "Timmy and the Tin Can Telephone" -- Crowell, 1959
5. Dalgliesh, Alice -- "Ride on the Wind" -- Scribner, 1956
6. Elkin, Benjamin -- "The Loudest Noise in the World" -- The Viking Press, 1962
7. Emberly, Ed. -- "Cock-a-doodle-do" -- Little, 1964
8. Freeman, Ira -- "All About Sound and Ultra Sonica" -- Random House, 1961
9. Gallant, Roy A. -- "Man's Reach Into Space" -- Garden City Books, 1959
10. Garelick, May -- "Sounds of a Summer Night" -- Young Scott Books, 1963
11. Greene, Carla -- "I Want to be an Airplane Hostess" -- Children's Press, 1960
12. Hogeboom, Amy -- "Planes and How to Draw Them" -- Vanguard, 1956
13. Hoyt, Edwin P. -- "Heroes of the Skies" -- Doubleday, 1963
14. Hyde, Margaret O. -- "Flight Today and Tomorrow" -- McGraw, 1962
15. Keen, Martin -- "The How and Why Wonder Book of Sound" -- New York Wonder Books, Inc., 1962
16. Kettlekamp, Larry -- "Gliders" -- Morrow, 1961
17. Kettlekamp, Larry -- "The Magic of Sound" -- Morrow, 1956
18. Kuskin, Karla -- "All Sizes of Noise" -- Harper, 1962 (Poetry)
19. Loomis, Robert D. -- "All About Aviation" -- Random House, 1964
20. Neal, Charles A. -- "Sound" -- Follet, 1962
21. O'Neill, Mary -- "Hailstones and Halibut Bones" -- Doubleday & Co., 1961
22. Podendorf, Illa -- "True Book of Sounds We Hear" -- Children's Press, 1955
23. Reuben, Gabriel -- "What is Sound" -- Benefic Press, 1960
24. Shaw, Thelma -- "Jeepers There's A Jet" -- Albert Whitman & Co. 1960
25. Showers, Paul -- "The Listening Walk" -- Crowell, 1961
26. Steiner, Charlotte -- "Listen to My Seashell" -- Knopf, 1959
27. Stuart, Merrie -- "The Airplane at the Airport" -- Melmont Publishing Co., 1958
28. Windle, Eric -- "Sounds You Cannot Hear" -- Prentice-Hall, 1963

B. Motion Pictures: A few 16mm films pertaining to this publication are listed below under the publisher's name and address:

1. Britannica Press, 425 North Michigan Ave., Chicago, Ill. 60611
   a. "An Airplane Trip by Jet" - 11 min., color, pri-el., 1961
   b. "Sound and How it Travels" - 11 min., b&w., pri., 1963

2. Churchill Films, 662 North Robertson Boulevard, Los Angeles, California 90069
   a. "Airport in the Jet Age" - 11 min., color, pri-el., 1962

3. McGraw-Hill Book Company, Text-Film Division, 330 West 42nd St., New York, N.Y. 10036
   a. "Airplanes and How They Fly" - 11 min., b&w, el.
   b. "Air All Around" - 8 min., b&w, el-jr.hi.

4. Sigma Educational Films, 11717 Ventura Boulevard, Studio City, California 91604
   a. "Community Airport, The" - 16mm, color, pri.-el 1966

5. Transportation, Dept. of, Federal Aviation Administration, Film Library, AC-921, Aeronautical Center, P. O. Box 25082, Oklahoma City, Oklahoma 73125. Films are available on a loan basis without charge. The requests should be mailed in time to reach the Film Library at least two weeks prior to showing.

   *a. "Best Investment We Ever Made" (FA-394) 24 min., color el-secondary, 1964
   *b. "Density Altitude" (FA-603A) 29 min., color, secondary, 1966
   c. "Dulles International -- Port of the Future" (FAC-121) 14 min., color, el-secondary, 1965
   d. "Flight" (FA-117) 28 min., color, el-secondary, 1962
   e. "How an Airplane Flies" (FA-703) 18 min., color, el-secondary 1968
   f. "Other Passenger, The" (FA-601) 30 min., color, el-secondary 1965
   g. "Plane is Born, A" (FA-602) 27 min., color, el-secondary 1968
   h. "Sonic Boom and You" (FA-811) 10 min., color, el-secondary 1968
   i. "Traveler Meets Air Traffic Control, A" (FA-102) 33 min., color, el-secondary, 1963
   *j. Weather films produced by Walt Disney:
      (1) "Fog and Low Ceiling Clouds -- Advection Fog and Ground Fog" (FAN-101) 23 min., color, el-secondary 1962
      (2) "Fog and Low Ceiling Clouds -- Upslope Fog and Frontal Fog" (FAN-102) 9 min., color, el-secondary, 1962
      (3) "The Cold Front" (FAN-103) 15 min., color, el-secondary, 1962
      (4) "The Warm Front" (FAN-104) 18 min., color, el-secondary, 1962

*These films will provide an excellent technical background for the teacher and may or may not be too advanced for viewing by elementary classes.

C. Filmstrips:

1. Britannica Press, 425 N. Michigan Avenue, Chicago, Ill. 60611
   a. "Science at Work" - 6 frames, color, pri-el (date unknown)

2. Federal Aviation Administration, Film Library, AC-921, Aeronautical Center, P.O.Box 25082, Oklahoma City, Oklahoma 73125. These filmstrips are available on a loan basis without charge. The requests should be mailed in time to reach the Film Library at least two weeks prior to showing date.

   a. "Flight to Grandmother's, A" - (FSP-2) min., color, 115 frames, pri.-el. Record (audible tone; inaudible tone for DuKane projectors). Sound on tape available in lieu of record if desired.

   *b. "Aviation--Where Career Opportunities Are Bright" - (FSP-1), 28½ min., 156 frames, color, jr.hi.-secondary 1968. 33 1/3 rpm record and a 114 page Counselor's Guide. This filmstrip may be borrowed as indicated above by teachers only or the whole package may be purchased for $10.00 from the National Aerospace Education Council, 806 15th Street NW, Washington, D. C. 20005. It was developed cooperatively by the U. S. Office of Education, the FAA and the NAEC.

*This filmstrip is developed mainly for secondary students and teachers; but is good for teachers of all grade levels for their information.

3. Jam Handy Organization, The - 2821 East Grand Boulevard, Detroit, Michigan 48211
   a. "Airplanes, Jets and Rockets" - A six filmstrip series, 35 frames each, color, el-jr.hi (approx. date 1967)
   b. "How do Helicopters Fly?" - 35 frames, color, el-jr.hi.
   c. "What Makes an Airplane Fly?" - 41 frames, color, el-jr.hi., 1960

4. Scott-foresman & Company, 1900 E. Lake Avenue, Glenview, Illinois 60025
   a. "Sounds Around Us" - 21 min, 78 rpm record, 1951

5. Charles Scribner's Sons, 597 Fifth Avenue, New York, NY 10017
   a. "Why an Airplane Flies" - 30 frames, color, pri-el, 1956

D. Publications:

1. The following publications are available free from the FAA area manager; regional public affairs officer; or FAA, Aviation Education, GA-20, Washington, D.C. 20590. A SELF-ADDRESSED GUMMED LABEL SHOULD ACCOMPANY EACH REQUEST. (See "F" under Section VIII of this publication for list of regional and area offices' addresses.)

D. Publications continued:

a. "Demonstration Aids for Aviation Education" (for teachers only)
b. "Teaching Guide for an Aerospace Communications Laboratory" (for teachers only)
c. "Aerospace Units for Elementary Science Classes, Grades 2 & 3" (for teachers only)
d. "A Flight to Grandmother's" -- The script and illustrations in this publication are taken from the filmstrip of the same name.

2. A complete list of free and inexpensive FAA publications may be requested from the Federal Aviation Administration, TAD-484.3, Washington, D. C. 20590. A SELF-ADDRESSED GUMMED LABEL SHOULD ACCOMPANY EACH REQUEST.

3. Publications available from the National Aerospace Education Council, Room 310, Shoreham Building, 806 15th Street N.W., Washington, D. C. 20005, are listed below:

a. "Look to the Sky", 50¢, Primary Readiness
b. "Aviation Activities", 50¢, Primary Workbook
c. "Helicopters at Work", 50¢, Intermediate & Upper Grades
d. "Jets", 50¢, Intermediate & Upper Grades
e. "Aerospace Arithmetic", 25¢, Elementary
f. "Flying and Weather", 10¢, Intermediate Grades
g. "Suggestions for Commemorating Wright Brother's Day", free, Elementary

4. Other technical and General Publications available from the Clearing House for Federal Scientific and Technical Information, U. S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22151 are as follows: (Each publication is $3.00)

a. AD 651-657 Economic Implications of a United States Supersonic Transport Aircraft Upon Airports and Enroute Support Services, Volume I: Executive Summary, December 1966, 52 pp.

b. AD 652-306 Economic Implications of a United States Supersonic Transport Aircraft Upon Airports and Enroute Support Services Volume II; Airports and Terminals, Dec. 1966,129 pp.

c. AD 652-313 Economic Feasibility Report U.S. Supersonic Transport, April 1967, 228 pp.

d. NASA TND-3587 Sonic-Boom Characteristics of Proposed Supersonic and Hypersonic Airplanes, F.E.McLean and H.W.Carlson, NASA's Langley Research Center, and L.W.Hunton, NASA's Ames Research Center, September 1966, 18 pp.

D. Publications continued:

e. AD 661 840 The Supersonic Transport - The Sonic Boom and You, J. O. Powers and K. Power, FAA, Department of Transportation, Washington, D. C., rec'd December 1967, 40 pp.

f. AD 801 320 Aircraft Noise and Sonic Boom; Selected References by FAA - Bibliography List 13, October 1966.

E. Suggested Sources of Airplane Photographs

American Airlines, Inc.
633 Third Avenue
New York, New York 10017

Beech Aircraft Corp.
Public Relations Dept.
9709 E. Central
Wichita, Kansas 67201

Boeing Company, The
Attn: Public Relations
P. O. Box 3707
Seattle, Washington 98124

Cessna Aircraft Company
P. O. Box 1521
Wichita, Kansas 67201

Delta Air Lines, Inc.
Public Relations Dept.
Atlanta Airport
Atlanta, Georgia 30320

Lockheed Aircraft Corp.
2555 N. Hollywood Way
Burbank, California 91503

McDonnell Douglas Corp.
Director of Public Relations
3000 Ocean Park Boulevard
Santa Monica, California 90406

Piper Aircraft Corporation
Lock Haven, Pennsylvania 17745

Trans World Airlines, Inc.
Director, Public Relations
605 3rd Avenue
New York, New York 10016

United Air Lines, Inc.
P. O. Box 66100
O'Hare International Airport
Chicago, Illinois 60666

F. FAA REGIONAL DIRECTORS' AND AREA MANAGERS' OFFICES

ALASKAN REGION
632 6th Ave.
Anchorage, AL 99501

PACIFIC REGION
P.O.Box 4009
Honolulu, HI 96812

WESTERN REGION
5651 West Manchester Ave.
Los Angeles, CA 90009

CENTRAL REGION
601 E. 12th St.
Kansas City, Mo. 64106

SOUTHERN REGION
P.O.Box 20636
Atlanta, GA 30320

EUROPE, AFRICA AND MIDDLE EAST
FAA
American Embassy
24-32 Grosvenor Square
London, W1, England

EASTERN REGION
John F. Kennedy
International Airport
Jamaica, N.Y. 11430

SOUTHWEST REGION
P. O. Box 1689
Fort Worth,TX 76101

REGION	AREA OFFICE	OFFICE ADDRESSES AND TERRITORIES IN EACH AREA
EASTERN	Boston	154 Middlesex St.,Burlington,MA 01803 -- CT,ME, MA,NH,NY (Part),RI, & VT.
	New York	Fed.Bldg.,JFK Int'l Airport, Jamaica,NY 11430 -- DE,NJ,NY (Part), & PA (Part)
	Washington	900 S.Wash.St.,Falls Church,VA 22046 -- DC,MD,VA, & WV.
	Cleveland	Center Ridge Rd.,Westview Bldg.,Rocky River, OH 44116 --KY,OH, & PA (Part)
SOUTHERN	Atlanta	P.O.Box 20636,Atlanta,GA 30320 -- GA,NC & SC
	Memphis	3400 Democrat Rd.,Memphis,TN 38118 --AL,MS,& TN
	Miami	P.O.Box 2014,Branch,Miami,FL 33159 --FL,PR,& VI
	Balboa, C.Z.	Drawer H. Balboa Heights, Canal Zone
	San Juan	RFD 1 Box 29A,Loiza St. Sta.,San Juan, PR 00914
CENTRAL	Kansas City	4747 Troost Ave.,Kan.City,MO 64110--IA,KS,MO,NB
	Chicago	3166 Des Plaines Ave.,Des Plaines,IL 60018--IL, IN, & MI
	Minneapolis	6301 34th Ave.,So.,Minn.,MN 55450 --MN,MT,ND,SD, & WI
SOUTHWEST	Fort Worth	819 Taylor St.,Ft.Worth,TX 76102 --AR,OK,& TX(Part)
	Houston	8345 Telephone Rd.,P.O.Box 60470,Houston,TX 77060 -- LA & TX (Part)
	Albuquerque	5301 Central Ave.N.E.,P.O.Box 8502, Albuquerque, NM 87108 -- NM & TX (Part)
WESTERN	Los Angeles	P.O.Box 45108, Los Angeles, CA 90045--AZ & So.CA
	San Francisco	831 Mitten Rd.,Burlingame,CA 94010 -- CA (Part)
	Seattle	FAA Bldg.Boeing Field,Seattle,WA 98108--OR,WA
	Salt Lake City	2398 W.North Temple,Salt Lake City, UT 84116 -- ID,NV & UT
	Denver	10255 E.25th Ave., Aurora, CO 80010 -- CO & WY

IX. Suggestions for Making a Kit to be Used in the Classroom

1. Ore samples - titanium, aluminum, etc. (Other type metals used in plane manufacture)
2. Tape of various environmental sounds
3. Dittos of possible work-sheets from other units of this "SST.T.T." series.
4. Master ditto of glossary
5. Balloons for creating sonic boom or demonstration of jet action.
6. Transparencies - (Blank plus those made from suggestions in Super Secret Treats* and others on sound or supersonic subjects.)
7. Puppets - of Consumers and airport personnel
8. Cut out type books of airport buildings - paper doll pilots - stewardesses, etc.
9. Plastic models of various types of planes and other noise makers -- train, motocycle, truck, etc.
10. SST model Kit (when available)
11. Flat pictures of airplanes and airports
12. Copies of Super Story Treasures. These stories can be made into records or tapes.
13. Hollow glass tube (12 inches or longer)
14. Tuning fork
15. Thermometer
16. Barometer
17. Different weights of paper and paper clips (bond paper to heavy construction paper for making airplanes.

* Another part of this "SST.T.T." series to be published by FAA.

X. GLOSSARY

1. Abort - to stop or fail in the early stages (The mission of the X-15 was aborted.)

2. Acoustics - science of sound (In our gymnasium the acoustics are poor.)

3. Air traffic control - having the specialty of the control and coordination of air traffic on airfields and in flight (The air traffic controller cleared the plane to land.)

4. Air turbulence - highly irregular atmospheric motion characterized by rapid changes in wind speed and direction, and the presence of up and down currents (The plane ride was bumpy because of air turbulence.)

5. Air wave - a disturbance of the air (The air waves lagged behind the jet as it broke the sound barrier.)

6. Airway - a designated route along which aircraft fly from airport to airport - (The plane flew along the designated airway.)

7. Altitude - height above sea level measured by an altimeter (The SST will fly at an altitude of 64.000 feet.)

8. Amplifier - device to strengthen electrical impulses (An amplifier was used in the recording of the sonic boom.)

9. Arrival - the act of coming to the end of a journey (Bad weather delayed our arrival.)

10. Atmospheric pressure - the pressure exerted in every direction at any given point by the weight of the whole mass of air surrounding the earth (Atmospheric pressure is about 15 pounds to the square inch at sea level.)

11. Barometric pressure - the pressure of the atmosphere usually expressed in the height of a column of mercury varying in response to changes in the atmosphere (The barometric pressure was measured by a barometer.)

12. Boom signature - the audible wave length when the boom pressure strikes the ground (The boom signature was recorded on the oscillograph.)

13. Concorde - the Anglo-French supersonic transport plane - It is limited to 1450 mph because of aluminum construction.

14. Cone shaped - a shape that has a rounded base and narrows to a point at the top (The shock waves lagging behind the SST are cone shaped.)

X. GLOSSARY continued

15. Cruising altitude - the height at which an airplane is flying when it is on course neither decending nor ascending. (The cruising altitude of the 707 was 34,000 feet.)

16. Decibel - the unit for measuring the loudness of sounds usually beginning at 0 (just audible sounds) and continuing to about 130 (pain threshold may be reached) (Ordinary speech is about 60 decibels.)

17. Departure -(a) a point from which a plane starts on its journey (The point of departure was Los Angeles International Airport). (b) the act of going away (His departure was delayed.)

18. Deplaning - to walk from a plane after flight (The passengers deplaned at Dulles International Airport.)

19. Enplaning - to board an airplane for purposes of travel (Irene enplaned at Los Angeles International Airport for the return trip.)

20. Experimental flight - a flight for the purpose of research or testing something (Experimental flights using the X-15 are in progress.)

21. FAA - The Federal Aviation Administration is responsible for the promotion, regulation and safety of civilian aviation and for the safe and efficient uses of airspace which is shared by both civil and military aircraft.

22. Frequency - the number of sound waves per second produced by a sounding body as a tuning fork (The sound of the plane increased in frequency.

23. Humidity - dampness or moisture of the atmosphere (The humidity on this hot day was 90 per cent.)

24. Hypersonic - any speed approximately five times that of sound in air, or greater (The hypersonic plane is a dream of the future.)

25. Insulation - using nonconductors to separate from conducting bodies as to prevent transfer of sound (The insulation of the house prevented our hearing the sound of the jets.)

26. Jet plane - an airplane powered by an engine that takes the air from the outside, compresses, heats (by combustion of fuel), and then expands in a jet or turbine (The jet airplane whined as it departed.)

27. Mach, Ernst - 1838-1916 Austrian physicist and philosopher who researched in the area of the five senses (Mach's name is used to honor him for his contributions to present day aviation.)

X. GLOSSARY continued

28. Mach number - a number representing the ratio of the speed of sound in the surrounding atmosphere (For subsonic speeds the Mach number is less than zero and for supersonic speeds it is greater than one.) (For example, half the speed of sound is Mach.50)

29. Mock-up- a structural model built accurately to scale (as out of plywood, cardboard, etc.) chiefly for study, testing or display (A mock-up of the SST was placed in a wind tunnel for testing.)

30. Noise - sound consisting of vibrations irregular as to the intensity, frequency, and phase (The noise of the airport made it necessary to shout.)

31. Noise abatement - the control and lessening of noise to a tolerable noise level (The noise abatement program at the airport was very successful.)

32. Noise suppressor - any technique or instrument used to reduce the noise level (Further study is being made to produce better noise suppressors.)

33. Oscillograph - an apparatus for recording or indicating alternating-current wave forms (The sonic boom was measured on the oscillograph.)

34. Overpressure - the standard measurement for the strength of the pressure waves propagated from the airplane given in pounds per square foot above normal atmospheric pressure. Normal atmospheric pressure is 2116 pounds per square foot. (The SST may produce about two pounds of overpressure.)

35. Pitch - degree of highness or lowness of a sound (The pitch of the song made it difficult to sing.)

36. PNdB - perceived noise decibels -- subjective scale of loudness or noisiness of aircraft noises as it is perceived by people (A propeller take-off may give a perceived noise level of 102 PNdB.)

37. Prevailing winds - winds that are most normal or frequent from the same direction for a certain area (The plane arrived early due to the prevailing winds.)

38. Prototype - the first full-scale, piloted, flying model of a new type of airplane (The prototype of the SST has not been built.)

39. Sea level - the surface of the level of the sea (The Boeing 707 flies 35,000 feet above sea level.)

40. Shock wave - the pressure pulses or waves when an airplane gains supersonic speeds (The SST will cause shock waves.)

41. Sonic - having a frequency within the hearing range of the human ear (Sonic is a term for talking about sound.) and having a speed in air of about 738 miles per hour (The airplane neared the sonic barrier.)

42. Sonic boom - a sound like an explosion produced when a shock wave formed by the aircraft traveling at supersonic speed reaches the ground (A sonic boom was heard when the jet was traveling at 800 miles per hour.)

43. Sound - what is or can be heard (Sound travels about 1100 feet per second.)

44. Specification - detailed, precise, explicit presentation (as by a working drawing) of something or a plan or proposal for something (The model for the SST was created according to specification.)

45. Subsonic - being a speed less than that of sound in air (The plane traveled at a subsonic speed and, of course, caused no boom.)

46. Supersonic - indicating or relating to speeds from one to five times the speed of sound in air (The SST will be a good subsonic as well as a supersonic plane.)

47. SST - Supersonic Transport (The SST is the American version of the supersonic transport, of titanium construction and travels 1800 mph.

48. TU-144 - Russian SST (Limited to 1450 mph because of aluminum construction.)

49. Trade-off - a compromise where you give a little to get a little (The designing of new aircraft often involves "trade-off" to achieve a more satisfactory product.)

50. Terminal -- either end of a carrier line as a railroad, trucking, shipping or airline (I went to the National Airport Terminal to meet the plane bringing my friend for a visit.)

51. Tone - difference in pitch between two sounds (F is three tones higher than C.)

52. Vibration - rapid movements to and fro (If you live in a sound-proof house,will you feel any vibrations?)

53. Wind protector - a cheese cloth type of hood placed over delicate instruments to prevent wind interference (The wind protector was used to cover the microphones along the air strip.)

54. STOL -- Short Take-off and Landing.

55. VSTOL -- Vertical Short Take-off and Landing.

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